Gemini (dual redundancy) Autopilot Manual V1.0

Zero UAV (Beijing) Intelligence Technology Co. Ltd

Contents

1. Warning and Disclaimer

Thank you for purchasing this ZERO UAV product. The product is an advanced and specifically dedicated control item. Any misuse may result in damage to property, injury or even death. The user must conform to the law and use the equipment responsibly. This product is not suitable for people under the age of 18. Please read this disclaimer carefully before using the product, or visit the GEMINI web page at http://www.zerouav.com to refer to relevant updates or information.

Warning

- Please keep the product out of reach of children.
- Make sure the aircraft is kept away from people and dangers such as buildings roads and property. We suggest you fly your aircraft at specially designated areas.
- Please do NOT fly this product when affected by drunkenness, tiredness, drugs, dizziness fatigue, nausea or any other condition that might impair your ability to control the aircraft.
- Please strictly follow the user manual when operating the device.
- Please make sure all components of the device are connected and work well, otherwise your unit may be damaged, destroyed or even buried!
- Please power off and remove propellers before making any adjustments to the unit such as calibrating, upgrading firmware or changing parameters. There is an ever present danger of the propellers starting unexpectedly and causing injury.
- Please do NOT fly in unfavorable conditions.
- Please do NOT open or modify the autopilot, there are no user serviceable parts inside.

Disclaimer

1. Zero UAV (Beijing) Intelligence Technology Co. Ltd. assumes no liability for damage(s) or injuries incurred directly or indirectly from the use of this product.
2. The user is responsible for abiding with the law and not behaving contrary to public order or public safety by using this product.
3. ZERO TECH accepts no liability for damage(s) or injuries directly or indirectly from the use of this product in the following conditions:

   (1) Damage(s) or injuries incurred when users are drunk, taking drugs, drug anesthesia, dizziness, fatigue, nausea and any other conditions no matter physically or mentally that

could impair their ability.

(2) Damage(s) or injuries caused by intentional operation or accident.

(3) Any mental damage compensation caused by intentional operation or accident.

(4) Failure to follow the guidance of the manual to assemble or operate.

(5) Malfunctions caused by refit or replacement with non-ZERO TECH accessories and parts.

(6) Damage(s) or injures caused by using third party products or fake ZERO TECH products.

(7) Damage(s) or injuries caused by misuse or poor judgment.

(8) Damage(s) or injuries caused by mechanical failure due to wear and tear.

(9) Damage(s) or injuries caused by continued flying after low voltage protection alarm is triggered.

(10) Damage(s) or injuries caused by knowingly flying the aircraft in an abnormal condition (such as water, oil, soil, sand and other unknown material ingression into the aircraft or if the assembly is not completed, the main components have obvious faults, obvious defects or missing accessories).

(11) Damage(s) or injuries caused by flying in the following situations: Using the aircraft in a magnetic interference area, radio interference area or government regulated no-fly zones, in bad light, when the pilot has blocked, fuzzy or poor eyesight or in any other conditions not suitable for operating.

(12) Damage(s) or injuries caused by using in bad weather, including rain, wind (more than a moderate breeze), snow, hail, lightning, tornado, hurricane etc.

(13) Damage(s) or injuries caused when the aircraft is in the following situations: collision, fire, explosion, flood, tsunami, subsidence, ice trapped, avalanche, debris flow, landslide, earthquake, etc.

(14) Damage(s) or injuries caused by infringement such as litigation caused by any data, audio or video material recorded by the use of aircraft.

(15) Damage(s) or injuries caused by the misuse of the battery, protection circuit, RC model and battery chargers.

(16) Other losses that are not covered by the scope of ZERO TECH liability.

2. Introduction: Functions

- The autopilot supports 9 types of aircraft: **Quad-Rotor:** +4, x4, x4(8 motors). **Hexa-Rotor:** +6, x6, Y6, Rev Y6. **Octo-Rotor:** +8, x8, V8. It is also possible to add **customized** configuration types.
- Supports firmware upgrade via USB cable to COM port.
- The autopilot can be controlled either by RC Transmitter, Smartphone or Tablet.
- A smartphone, Tablet or PC may be used to adjust the parameters.
- 4 working modes supported: Manual stabilization, Auto-hover (Semi-auto takeoff), Auto navigation (supports single waypoint edit) and Return home/landing (auto- return home if signal lost supported)
- LED indication of Autopilot Status including: GPS location, low voltage alert, attitude error etc.
- Multiple safety features supported including auto-returning home when control is lost, black box records, safety parachute deployment etc.
  - Camera shutter support
  - Z series brushless gimbal and servo gimbal support.
  - RC receiver support (with S-BUS or S-BUS converter module)

3. In The Box:

<table>
<tr><td colspan="2">■Hardware □ Software（Download）</td></tr>
<tr><td colspan="2">■ Gemini M (Master Controller) x1 and Gemini S (Slave Controller) x1</td></tr>
<tr><td>The MC (Master Controller) combines and communicates with the other modules and external electronic devices to carry out its function as a complete autopilot system. Firmware is updated in this unit via its RS232 COM port. The YS-GCS (Ground control Station) records real time flight state via WI-FI

The SC (Slave Controller) is the backup for the master controller, and duplicates everything exactly.</td><td> 
  </td></tr>
<tr><td colspan="2">■ GPS+COMPASS （GPS for short）x2</td></tr>
</table>

The GPS/Compass modules are for sensing the orientation of the aircraft by reading its position and direction	
■ LED Indicator x1	
The LED indicates current flight status of the craft. The light shows information such as flight mode, number of satellites in view and battery used.	
■ S-BUS Converter module	
This unit is used if the RC receiver does not have SBUS support It connects between the RC receiver and the S-BUS port on the MC.	
■ Power Supply Module x1	
Supplies regulated power for the autopilot and the Wi-fi module	
■WI-FI Module X1 （The Data Link can be added to increase the range of this unit）	
Connects the Auto Pilot to the Ground Station via WI-FI (Wireless Network) Supports 2 work modes: Peer to Peer and Router	
■ GPS Bracket x2 The GPS＋COMPASS is sensitive to magnetic interference. This bracket is used to mount the GPS module where necessary and to keep it far away from EMI sources.	
■ RS232 COM port to 3-PIN Servo Cable X1	

Used to connect PC USB port to Master Controller to upgrade the firmware only.
■ Warranty Information Card X1 This provides Product Serial No., Purchase Date. Please fill out the relevant information and return to Zero UAV to register your product warranty.
□ GS Software for Android System □ Firmware Upgrade Software on PC.

4. Introduction: Installation

4.1 Aircraft Types

The Gemini dual redundancy (Gemini dual redundancy called Gemini in this Manual) supports the aircraft types shown below:

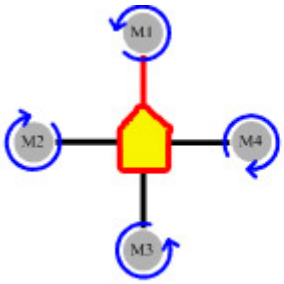
The blue arrows in each diagram give the direction of rotation of the rotors.

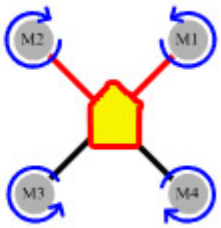
For coaxial propellers: Blue means propeller at the top; Purple means propeller at the bottom.

The yellow arrow in the center of each figure points to the aircraft nose.

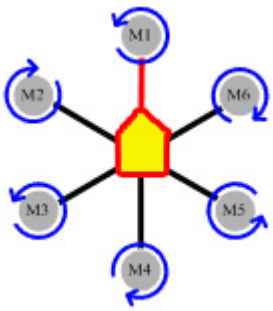
The number under each diagram means the "Aircraft Type" which should be used in the Parameters Setup section.

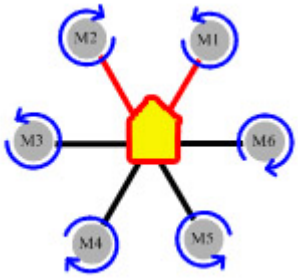
① Quad-Rotor: +4, x4



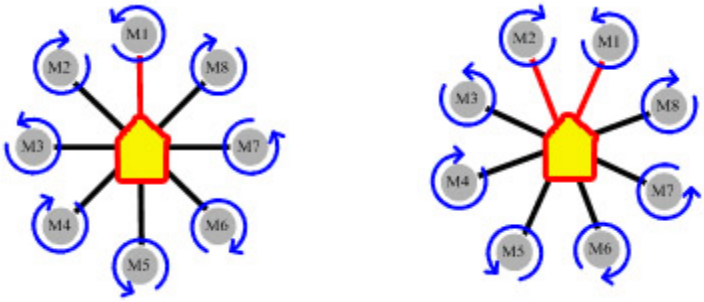


② Hexa-Rotor: +6, x6

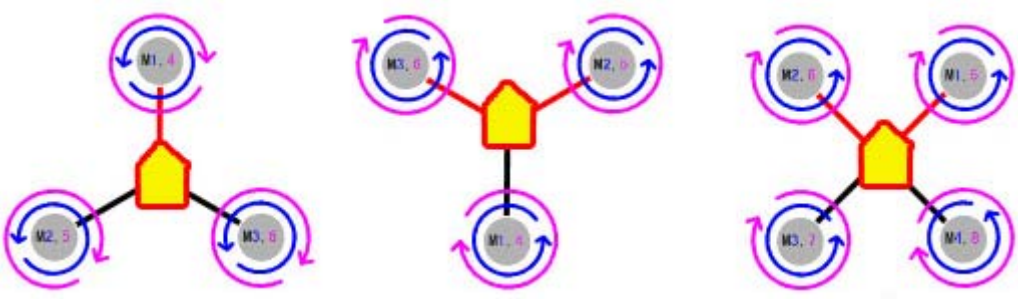




③ Octo-Rotor: +8 , x8



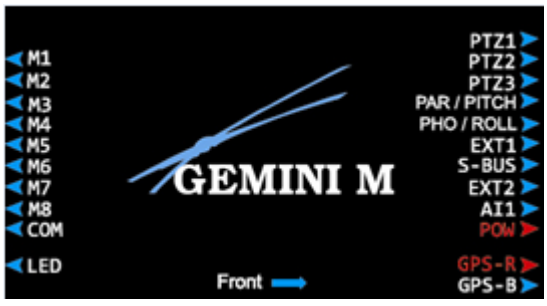
④ Hexa-rotor Rev Y and Y, Quad-copter x4(8 motors)



4.2 Autopilot Installation

Configure the Gemini M and Gemini S precisely parallel to the central axis of the aircraft. It can be placed in any position on the central platform, but the arrow direction must be same as the aircraft heading direction, and should be close to the center of gravity of the aircraft.

The main controller has an internal shock-absorbing structure; there is no need to add extra shock-absorbing devices such as gyro gel or sponge. It should be hard-mounted to the aircraft. **(Arrow labelled "Front" must point to the aircraft head)**



4.3 GPS+COMPASS configuration

The side with the logo must face upwards; the arrow must point to the aircraft head. If this is not done the aircraft may "toilet bowl" in GPS mode, and might not be able to auto hover normally.

The GPS module must be mounted on the GPS bracket using the supplied double-sided adhesive pad and placed in an elevated position to keep it away from any electronic devices, such as cables, video transmitting devices and anything that is not electronically shielded.

5. Ports

5.1 Port definition

1) Gemini M: Port definition

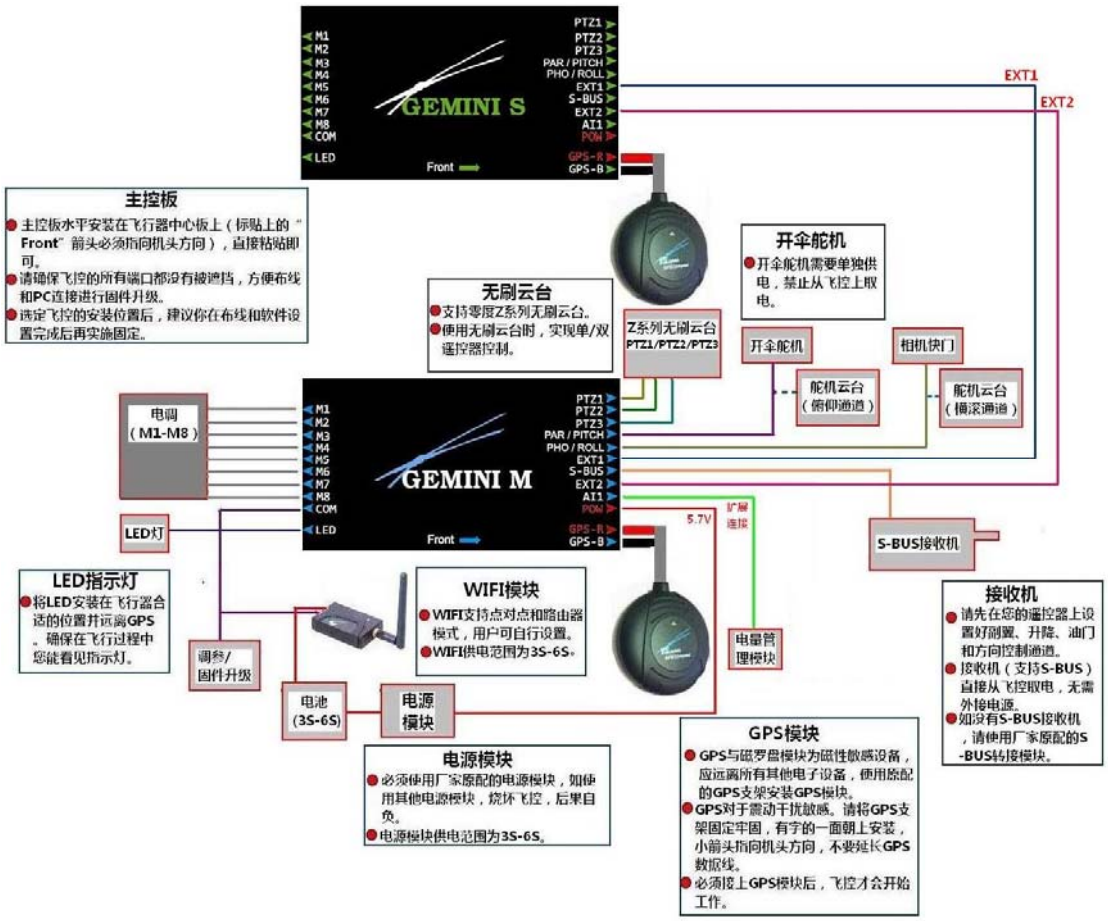
Port	Port Function	Port	Port Function
M1	ESC to motor 1	**PTZ1**	PTZ1 of Z Series gimbal
M2	ESC to motor 2	**PTZ2**	PTZ2 of Z Series gimbal
M3	ESC to motor 3	**PTZ3**	PTZ3 of Z Series gimbal
M4	ESC to motor 4	**PAR/PITCH**	Connect to Parachute Servo or Gimbal Servo (pitch channel)
M5	ESC to motor 5	**PHO/ROLL**	Connect to shutter or Gimbal servo (Roll channel)
M6	ESC to motor 6	**EXT1**	EXT1 (Gemini S)
M7	ESC to motor 7	**S-BUS**	S-BUS receiver
M8	ESC to motor 8	**EXT2**	EXT2 (Gemini S)

COM	RS232 COM for adjusting parameters on PC or connecting WI-FI module and Data Link	**AI1**	Connect to Power Management Module
LED	Connect to LED indicator	**POW**	Connect to 5.7V output of Power Module
		GPS-R **GPS-B**	GPS RED End/GPS Black End

2) Gemini S： Port Definition:

Port	Port Function	Port	Port Function
M1	N/A	**PTZ1**	N/A
M2	N/A	**PTZ2**	N/A
M3	N/A	**PTZ3**	N/A
M4	N/A	**PAR/PITCH**	N/A
M5	N/A	**PHO/ROLL**	N/A
M6	N/A	**EXT1**	EXT1 Gemini S)
M7	N/A	**S-BUS**	N/A
M8	N/A	**EXT2**	EXT2 (Gemini M)
COM	N/A	**AI1**	N/A
LED	N/A	**POW**	N/A
		GPS-R和 **GPS-B**	GPS-R to GPS red terminal GPS-B to black terminal

5.2 Connection Diagram:



NB:

1）The Power supply module and the WI-FI module need to be powered from a 3S-6S LIPO battery. (from 10.8V-25.5V)

2）The RC Receiver gets its power directly from the autopilot **DO NOT** power the receiver directly from a separate supply as this may destroy your GEMINI!

3) Motors and ESCs (Especially when several ESCs are together), can cause serious magnetic interference so the GPS module must be as far away from these as possible. A non-ferric bracket must be used with the arrow on the GPS facing forward. Also the battery connection carries a high current and may result in a strong magnetic field. Keep the battery wires as far away as possible from the GPS module otherwise your aircraft may fly in circles!

4) The video transmitter must be located as far away as possible from the autopilot, as it might cause serious interference.

（1）5) If you have connected the autopilot correctly you can power it up by connecting the battery. Do not connect the power to the ESCs at this stage and you should not have installed the propellers. The Gemini should initialize in seconds, and then the LED should begin flashing red in short bursts of 3 ●●● ●●● ●●● . This means the system connection is correct and is starting normally. For LED status, please refer to appendix.

6. Debug Preparation

The Gemini autopilot provides 2 different ground control software (GCS) versions: the PC version and the Android version. We recommend that you use the Android version in preference as it is more convenient to use.

6.1 Installing Phone GCS

Download the YS-GCS Android software from our official website http//www.zerouav.com The App must be installed to the Mobile memory card. It can be installed automatically by selecting INSTALL on the APK file once located in the file manager.

6.2 WI-FI set up

6.2.1 WI-FI Communication mode

The GEMINI autopilot has two communication modes: PTP (Peer to Peer) mode and Router mode. PTP connects your phone or tablet directly to the Wi-fi module on the Gemini. In router mode your phone/tablet connects to a router which is connected via Wi-fi to the GEMINI Wi-fi module. The default mode is PTP mode, its SSID and password is on the warranty card.

A video indicating WI-FI configuration is at:

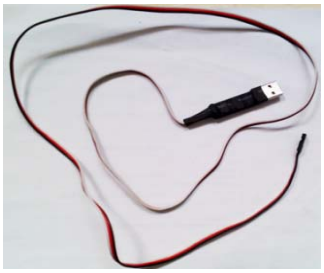
http://v.youku.com/v_show/id_XNTE2OTY4MjQ4.html

After you have connected to the Gemini successfully all subsequent flight data is saved on your phone/tablet in the folder "Yshj" in the root directory of your file manager. This data can be used to review your flight and to analyze it.

6.2.2 WI-FI Configuration

6.2.2.1 Hardware Connection

Use the USB/Serial COM cable to connect the USB port of the WI-FI module to any USB port on your computer. You must power the Wi-fi module with your 3S-6S Lipo battery. The Wi-fi module does not take its supply from the USB cable.



When connecting the Wi-fi module to the Gemini M, the black wire of the communication cable is located at the upper right corner of the WI-FI module.

When connecting the Wi-fi module to the computer, the white wire of the communication cable is located at the upper right corner of the WI-FI module.

6.2.2.2 Software Setup

① PTP mode:

In PTP mode (Peer to Peer mode) there is no need to use a wireless router, and you can set up a password so that nobody else can connect to your WI-FI during your flight or at any other time. The autopilot will establish a wireless network named "ZERO-TECH" and you may connect to this network using your Phone or tablet.

To see the status of your wi-fi communication look at the Blue LED on your wi-fi module. If there is no connection it will flash rapidly. When there is a successful connection the LED will display a solid light. Your GCS (Ground Control Station) will then be able to communicate. It

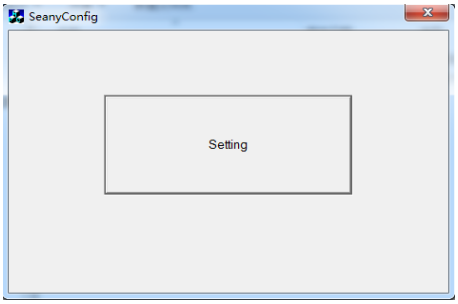
may be that your phone/tablet is not compatible with PTP mode, In this case please refer to the WI-FI configuration video tutorial and set it up in router mode.

http://v.youku.com/v_show/id_XNTE2OTY4MjQ4.html

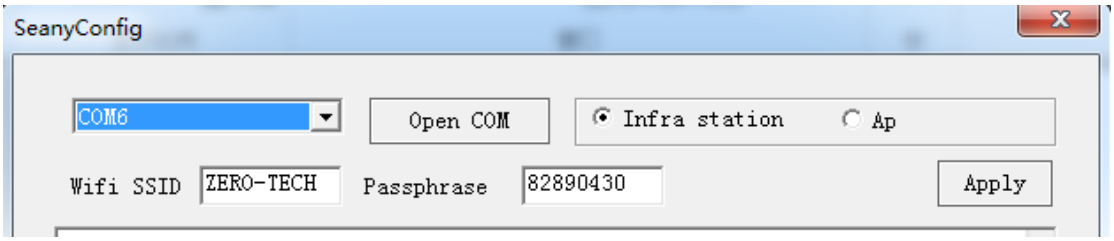
PTP configuration is shown below:

Step 1: Open the WI-FI configuration software on your PC (obtainable from zerouav.com)

It will show a "SeanyConfig" window.

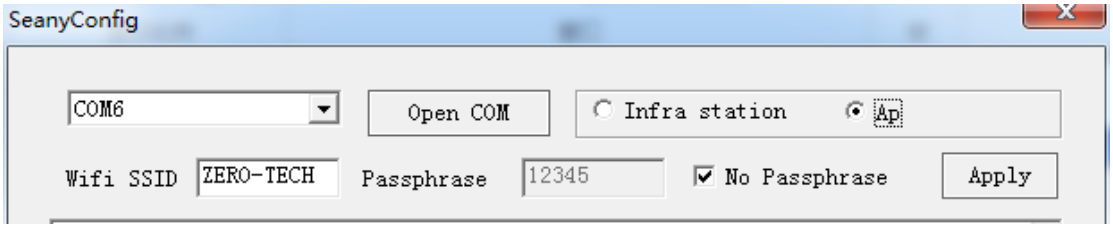


Step 2: Click "Setting", it will show the main configuration interface.



Step 3: Select the correct COM port. If you are unsure which port this is you can search for the "Prolific USB-to-Serial Comm Port" in your Windows Device Manager. This will give you the port number.

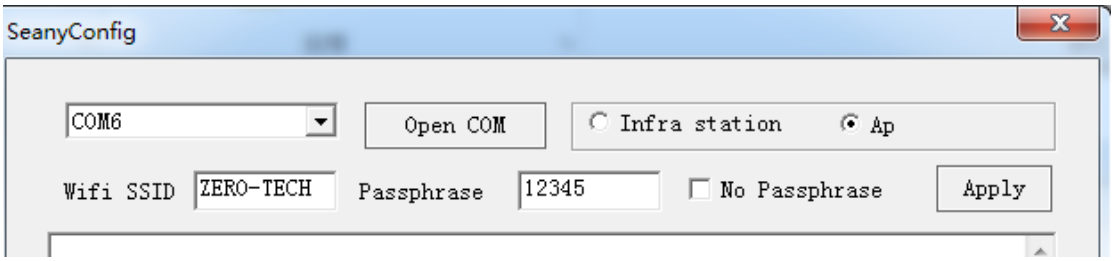
Step4: Select "AP" (Access Point) which is "PTP mode"



Step 5: Put in the SSID of WI-FI module, this must be "ZERO-TECH"。

Step 6: Uncheck "No Pass phrase" and then enter your WI-FI password (Password must be exactly 5 numbers)

Step 7: Click "Apply"



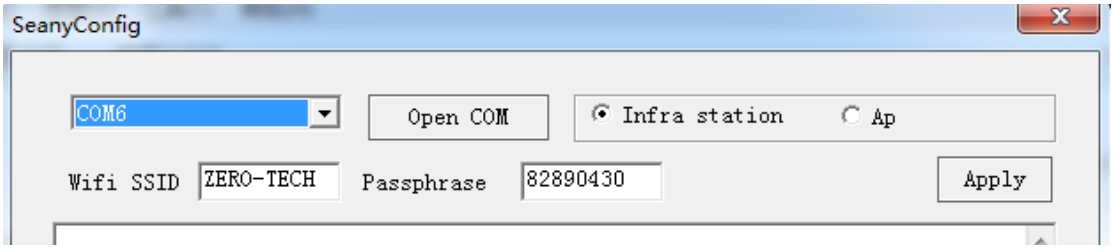
Step 8: Wait until configuration is completed. After which a window showing "AP mode OK" will appear. Now click "Confirm" and quit.

Now you will be able to find the SSID in the wireless network which you have just set up ("ZERO-TECH")

② Router mode:

If you want to increase the communication range of your wireless set up, you might want to use a router to boost communication.

Start in the same way as for PTP mode setup to configure Router mode, but select "Infra station" not "AP"



Setup the SSID of your router to be the SSID of WI-FI mode (The default is "ZERO-TECH" and

please note the letters must be in capitals)

Set the password to be the WI-FI module's password (Default is 82890430).

The encryption method must be **WPA2-PSK AES**, and the IP is **192.168.1.1**。

Refer to the tutorial video for help in setting up router mode at:

http://v.youku.com/v_show/id_XNTE3NzE1NDcy.html/

To see the status of your wi-fi communication look at the Blue LED on your wi-fi module. If there is no connection it will flash rapidly. When there is a successful connection the LED will display a solid light. Your GCS (Ground Control Software) will then be able to communicate.

6.3 RC Transmitter setup

Setup your Transmitter for **fixed-wing** mode (Type "AIRPLANE" or "Acro"). Do not setup any mixes and if you are using FUTABA do not reverse any channels. Set everything to default. If you are not using FUTABA your transmitter may vary, for example JR and WFLY Transmitters need all channels reversed.

NB:
1) You are provided with the option to fly with one transmitter (controlling both aircraft and gimbal) or two transmitters (one for aircraft, one for gimbal) when using Zero TECH Z-series gimbals. If only one transmitter is used, camera shutter control is disabled. Shutter control can be used via the GCS manual shutter control which is available when carrying the Z2000 gimbal.

6.3.1 Dual transmitter setup

Step 1, aircraft transmitter setup

In the FUNCTION menu select a 3-way switch to control channel 5 (CH5) and a 3-way switch to control channel 6 (CH6).

The working modes are shown below:

CH5 Status	CH6 Status	Working Mode
CH5 position 1	X，any position	Manual stabilization
CH5 position 3	CH6 position 1	Auto hover
CH5 position 3	CH6 position 2	Auto navigation
CH5 position 3	CH6 position 3	Return home and land

NB: Priority is Manual mode. In any mode flight status will revert to manual mode when CH5 is switched to position 1: the aircraft will come under the control of the operator.

Step 2; setup CH7 to a knob switch.

Step 3; setup CH8 to a knob switch to control taking pictures deployment

Step 4; setup Fail Safe (F/S) protection.

Please refer to the user manual of your RC Transmitter for instructions to set up Fail Safe. For the GEMINI (dual redundancy) autopilot, Failsafe settings should be as follows: setup CH5 to position 3, CH6 to position 3, keep throttle in the middle (50% approx...)

Video reference link：http://www.tudou.com/programs/view/e1ai526Mbt4/

Gimbal transmitter setup

Step 1; setup CH5 to a 3 position switch, CH6 to a 3 position switch.

Step 2; If carrying the Z2000 gimbal set CH8 to a 2 position switch to control the camera shutter.

6.3.2 Single Transmitter setup

Step 1; setup CH5 to a 3 position switch, CH6 to a 3 position switch.

Step 2; setup Ch7 to the RS or LS lever channel to control the pitch of gimbal;

Step 3; setup CH8 to a knob switch to control taking pictures.

Step 4, set up Fail Safe F/S protection

Set up F/S first. For the GEMINI autopilot, setup CH5 to position 3, CH6 to position 3, keep throttle in the middle (50% approx)

7. GCS Software Setup

After connecting the GEMINI data successfully you should calibrate your compass first. (If your compass is not calibrated correctly your phone will vibrate and you will not be able to arm the motors). The next thing to do is to set up the whole aircraft system using the Installation guide in your phone/tablet GCS or you can use auto-setup.

If you are doing this for the first time it is suggested you use the "Installation Guide" on the Phone GCS. If you use auto-setup the first time then steps may be missed out which could result in damage to your aircraft.

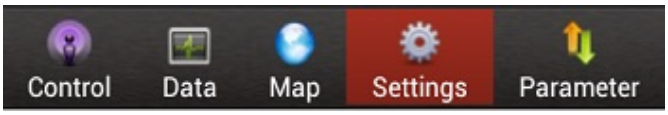
If you cannot connect to your GCS data, please review the instructions above carefully before carrying on with configuration

When configuring and installing the system, please make careful note of the following:

1. It is suggested that you have a system where you can power the ESCs and motors separately from the rest of the system. When starting the system on the ground, please switch on the transmitter FIRST and then power up the autopilot. When everything is configured and ready you can then power the motors. When working on the system it is always a good idea to remove the propellers entirely to avoid the possibility of serious injury.
2. Switch the transmitter to manual mode and pull the throttle lever to the bottom before entering setup (Before clicking "Enter Setup" button)

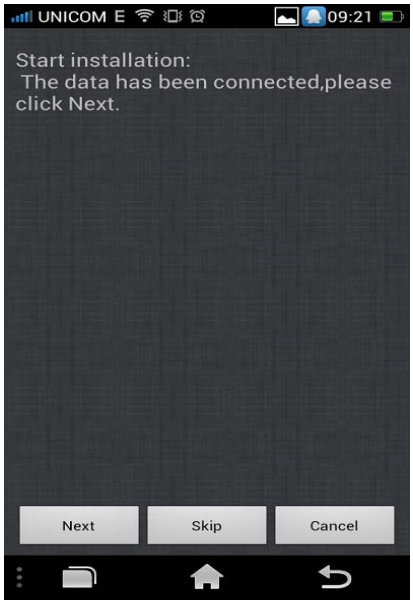
7.0.1 Ground Station software Settings (Installation Guide)

a. Open the YS-GCS app on your phone or tablet，Click "Settings" as shown below:



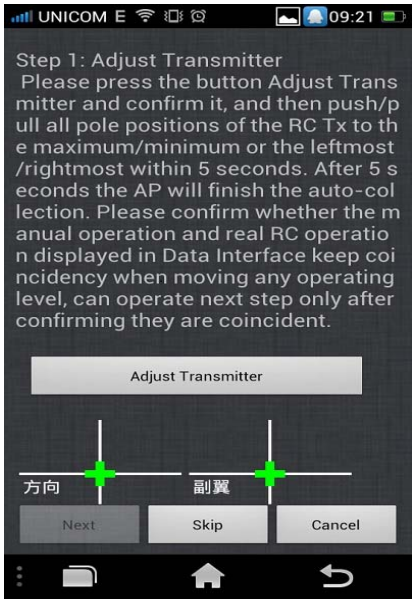
b. After clicking "Settings" you will see the settings page

1. C. Click "Installation Guide" in the Settings page, and follow the installation steps shown below. If your data is not connected you will not be able to proceed:



Start Installation:

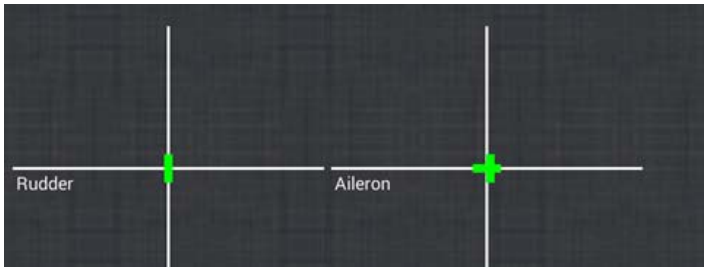
Data connected, click "Next"

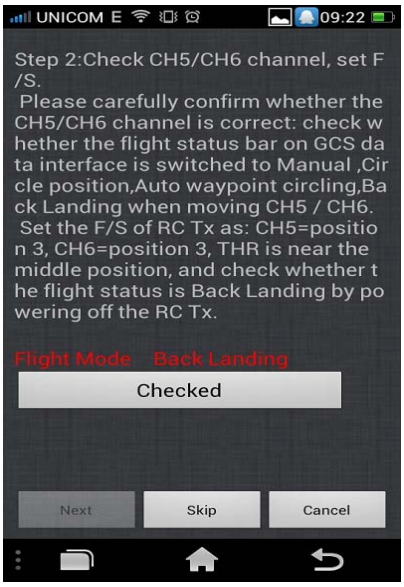


Step 1: Adjust Transmitter.

Press "Adjust Transmitter" then press "OK" to confirm. Within 5 seconds move both transmitter sticks to their extreme limits, both left/right and up/down. After 5 seconds the auto-pilot will complete data collection.

Now make sure that the direction and movement of the sticks is reflected accurately in the diagram below. You can only proceed to the next step after confirming this.





Step 2: Check Channels CH5 and CH6 and set Fail Safe (F/S)

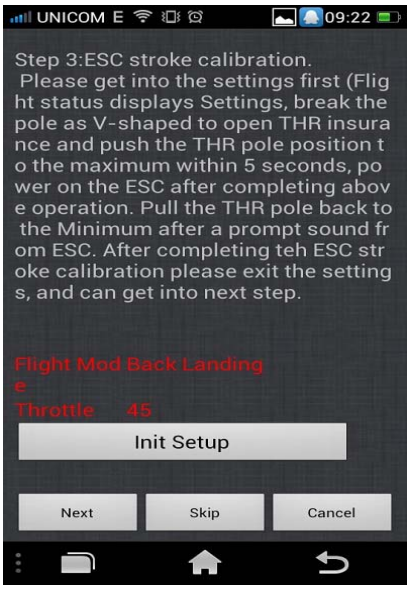
Confirm that CH5 and CH6 is setup correctly by observing the RED status indication below.

CH5 position 1 should indicate Manual

Switch CH5 to position 2 and check: CH6 position 1 "Auto Hover"; CH6 position 2 "Waypoint Navigation"; CH6 position 3 "Return Home and Land".

Now set F/S on your transmitter to CH5 in position 3; CH6 in position 3 and throttle in centre position.

Turn off your transmitter and check the status as "Return Home and Land"



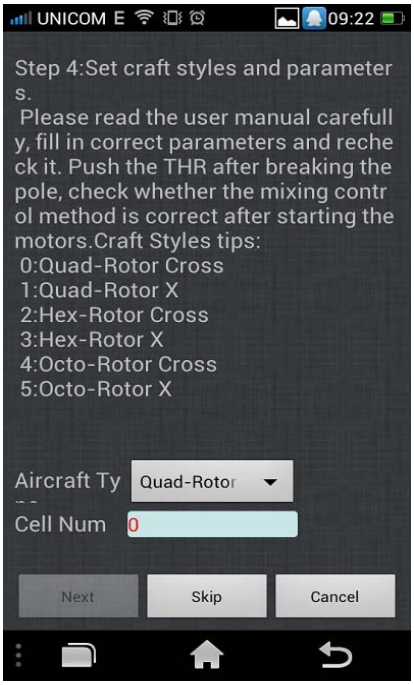
Step 3: ESC Calibration (Remove propellers!)

1. Power up the FC (but do not power the ESCs yet) then Click "Init Setup" below.

3. Move the sticks in a "/ \" direction (Modes 1, 2) or"\ /"direction (Modes 3, 4) to "Arm" the ESCs. (As described in the manual in Section 11.2)

4. Increase the throttle stick to maximum and within 5 seconds apply power to the ESCs. When the ESCs respond with a sound prompt, return the throttle stick to minimum.

5. Calibration is now completed and you can click "Next"



Step 4: Set up craft parameters.

Please read the user manual carefully and enter the correct parameters below.

Aircraft Types are:

0: Quad-Rotor Cross (+)　　1: Quad-rotor X

2: Hex-Rotor Cross (+)　　3: Hex-Rotor X

4: Octo-Rotor Cross　(+)　　5: Octo-Rotor X

Enter the number of cells in your lipo flight battery and the magnetic declination for your location. (West is negative and east is positive)

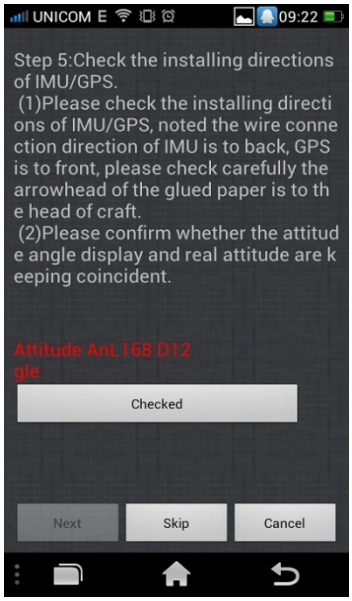
Now click "Send". You should now arm your system and check that the correct motors start when you activate the sticks. (Mixing is correct.)

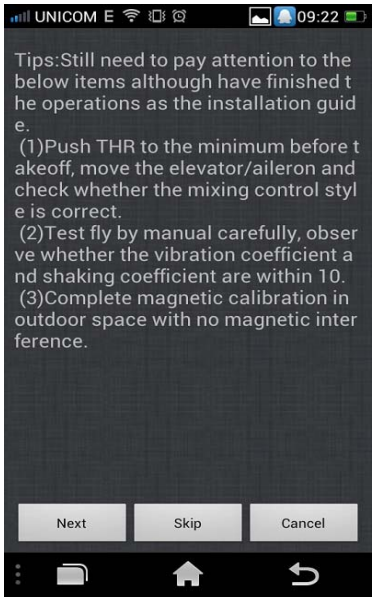
Step 5: Check alignment and direction of IMU and GPS

1. To double-check that the direction of the units are correct, make sure the wiring of the IMU faces to the back and the cable of the GPS faces to the front of the aircraft. Check that the arrows on both face the front.
2. Check the Attitude Angle shown below matches the actual attitude.
3. Click "Checked" only after you are certain of the above 2 very important items!

You have now finished the installation procedure but you still need to pay careful attention to the items listed below:

1. Ensure you carry out the magnetic calibration dance outdoors, clear of magnetic interference. (Large metallic objects like cars, shipping containers etc.)
2. Arm and start your motors before take-off and carefully check that your motor-mixing is correct and the direction of rotation is also correct.
3. Test fly and carefully check on your GCS that the vibration and shaking coefficients are less than 10.
4. Click "Next" to exit the installation guide and then in "Settings" click "Quit Setup"





Step 5 Step 6

Enter the final page to finish the software adjustment. Click "Next Step" and exit from installation guide.

There is a tutorial video at: http://www.youtube.com/watch?v=EWcCqMgb9bU

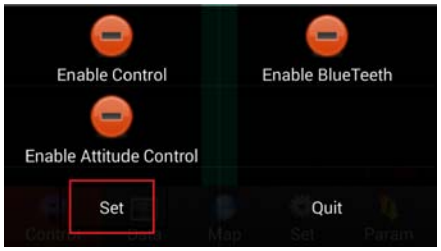
7.2 Manual Setup

7.2.1 Calibrate stick travel on the RC Transmitter

NB: For safety reasons, please disconnect power from the motors and/or remove propellers whilst performing the calibration.

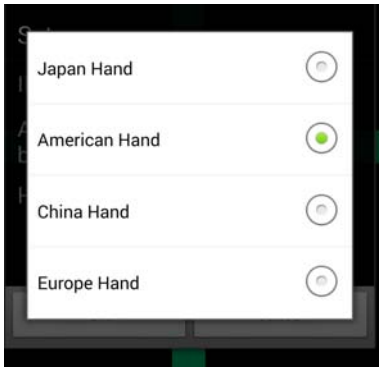
Step 1: Select the correct stick layout

Click the menu button on your phone then select "Set" (see below)

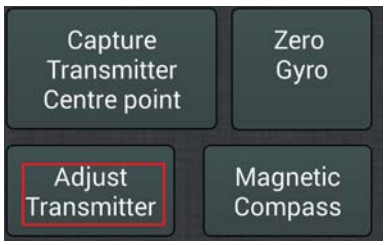


In the "Set" box select "Hand mode" menu.

Select your own operation style in the hand mode menu. For example “American Hand” is Mode 2.



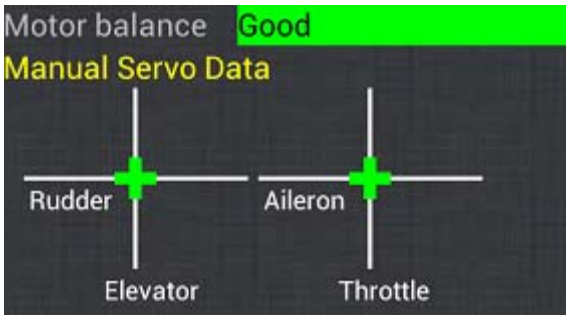
Step2: Calibrate the stick travel



Return to the “Set” menu and scroll to the screen to where you can see “Adjust Transmitter”. Click the button and click "OK" in the dialog box. Move both sticks to their end points in a circular motion within the next 5 seconds. The autopilot will store the maximum and minimum end points and also the mid points of both sticks.

Step 3: Check that the GCS shows the sticks moving in the same direction as depicted on the

screen. You might need to reverse channels if you are not using a Futaba transmitter.

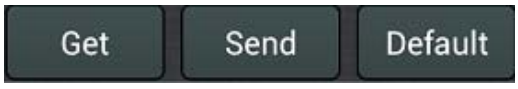


This screen displays the position of the sticks. On the left is the Rudder and Throttle (Mode 2 depicted). On the right is the aileron and elevator stick (Mode 2 depicted).

When both sticks are in the middle position they are shown as green, any other position shows red except for when the throttle stick is at the bottom when it shows as yellow. When the throttle is in hover position (normally close to the middle position) it shows green.

If you have made any adjustment and the position is not shown in green when releasing the sticks, you will need to click the "Capture middle position" button in the "Set" screen of the GCS allowing the autopilot to record the correct middle position of the sticks.

7.2.2 Setting up Aircraft types and Parameters



1）Getting the current parameter set-up of the aircraft

Click the 

button to get the current parameters. (Click several times if it fails) Normally the autopilot uses the default parameters.

After changing any parameter settings away from the current settings you must click the 

button (click several times if it fails), and this will upload the revised parameters to the autopilot. If you want to recover the default parameters, you need to switch to manual mode and pull the throttle stick to the bottom and then click the 

button.

2) Select the correct aircraft types

Select the correct aircraft types in "aircraft types" on the "parameter" page

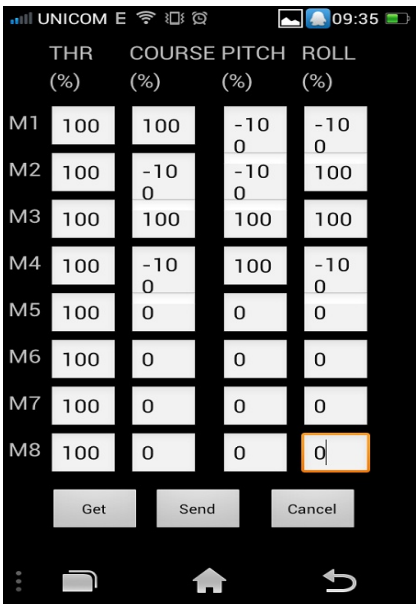
Setting up defined parameters (If you have one of the standard aircraft indicated in the menu list, you can skip this part.)

If you have a customized or abnormal layout aircraft, you can define how each motor is mixed, and you can define the increase or decrease in the percentage coefficient on each of the roll/pitch/rotation channels of each motor.

Detail is shown below:

Channel-	Operation	Range of values for manually entered parameters
Throttle	Climb up/down	All should be 100
Direction	Right rotation	Decrease to -100，or Increase to 100
Pitch	Nose down	Decrease to -100，or Increase to 100
Roll	Right Roll	Decrease to -100，or Increase to 100

For example: an “X” configured Quadcopter would have parameter settings as seen below:



Parameter Definition In Detail:

Step 1: Click "Mixing Define" in the settings page to get the "Customized Parameters dialogue. Enter your user defined parameters and click the "Send" button. This will upload your amended data to the autopilot. Now as a double check, click the "get" button to reload your values from the autopilot to the GCS. Check that you still have your own values displayed and you are all set.

Step 2: After confirming this, change the "aircraft type" in "Parameter" page to "Customized"

Step 3: With the new parameters power on the autopilot, arm the motors and push the throttle stick a little to make the motors rotate slowly, check carefully whether the motors respond in the expected way according to your settings. If all checks out then you can start your trial flight.

(For safety reasons, you should remove your propellers when testing your customized settings.)

7.2.3 Checking channel CH5, channel CH6 and F/S (Failsafe)

Step 1: Check your working modes

Assuming your GPS module is ready; now check whether switching between all working modes is working normally.

For example with CH5 at position 1 and CH6 at any position the GCS "data" page should show your TX status as "Manual", if not, please check your hardware connection or RC Transmitter setup.

Step 2: Fail Safe F/S checking

Switch off the RC Transmitter whilst the autopilot is still powered, the flight status should switch to display "Go home and land", the throttle stick indicator should be in the middle and display in green. If not, please setup the fail-safe (F/S) again.

7.2.4 ESC Stroke Calibration

Please remove your propellers before doing the following!

Notice: Some ESCs which have been designed specifically for multi-rotors do not need to be calibrated. Here we take the Hobbywing ESC as example:

Step 1: Connect the autopilot power only, pull the throttle to the bottom, put CH5 to position 1.

Step 2: Click "Init Setup" in "Setting" page.

Click "Confirm" button in the dialog box. Now the "Flight Mode" should be displaying as "Settings State" in the Data screen of the GCS.

After arming the motors (Refer to the relevant instructions), push the throttle all the way to the top and then connect power on **(No propellers!)**

Step 3: After the ESC sounds its "didi.....” pull the throttle back to the bottom, now the ESCs should sound "didi....." three or four times according to the number of cells in the battery. This means the calibration has succeeded.

Step 4: Click "Exit" from the "Setting" page, and click “OK” to confirm.

7.2.5 Checking the Gemini autopilot and its GPS Configuration

1. The arrow direction of GEMINI autopilot and GPS/COMPASS module should be pointing in the same direction as the aircraft head.
2. Please make sure the GEMINI autopilot is configured whilst level, and the GPS module is also leveled and is higher than everything else.
3. Ensure both are firmly fixed.

8 Field Testing

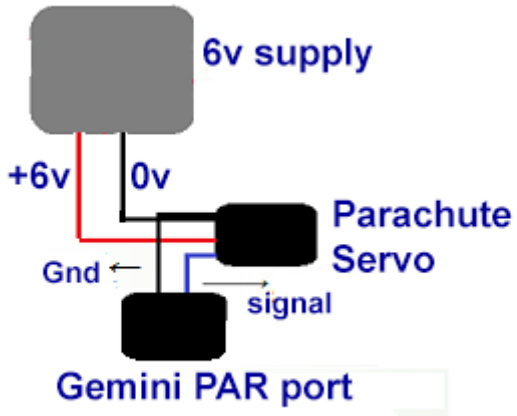
8.1 parachute open/close testing

Notice: (1) Parachute is not supported if using servo gimbal.

(2) The deployment of the parachute has a strong catapulting force, please

be careful when configuring and please keep your head away from the unit.

The GEMINI autopilot PAR output channel outputs a PWM signal which can control a servo to open the parachute. The parachute servo must have an independent power supply so that the parachute can still open if everything else has failed.



Detailed steps: Enter "settings" page and on the bottom of the page, you can see two boxes with "Test Close Parachute" and "Test Open Parachute", a diagram will pop up for your confirmation when you click it. Confirm it by clicking the "OK" and the servo of the parachute will be actived. No channel on the Tx radio is for opening the parachute manually, it's set to open automatically when the attitude of the copter reaches 70 degree.

8.2 Compass Calibration

When using the GEMINI autopilot for the first time, the GPS/COMPASS must be calibrated before arming the motors. Compass calibration does not need to be done every time you fly but should be done when components are moved or if the aircraft flies in unexpected ways, like in circles, for example. Calibration should not be done indoors or when there are large metallic objects nearby such as cars or shipping containers. Always calibrate outdoors in the clear.

NB: The Master Controller and Slave Controller can be calibrated at the same time, there is no need to do them separately.

There are 3 steps to follow:

1. Level calibration

2. Vertical calibration

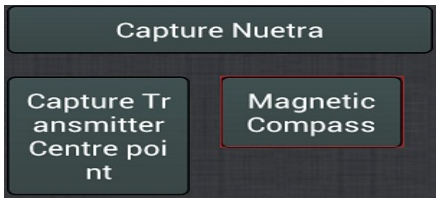
3. Save GPS/COMPASS data.

The status is displayed in the "Set" Page at the top as shown below:

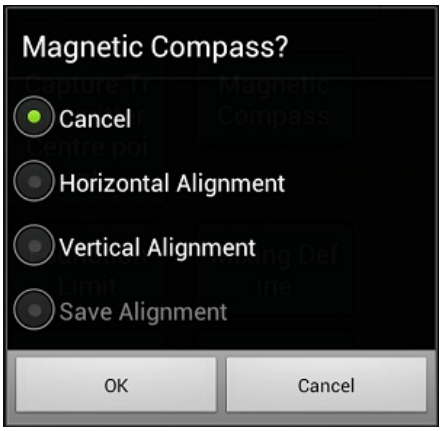
Proceed as follows:

Step 1: Switch to manual mode and pull the throttle stick to the bottom.

Step 1: Click “Magnetic Compass" in the "Set" Page.



Step 3: Select "Horizontal Alignment" in the dialog box, and click "OK" button to start level calibration. If you don't want to keep on calibrating select "Cancel" and confirm.



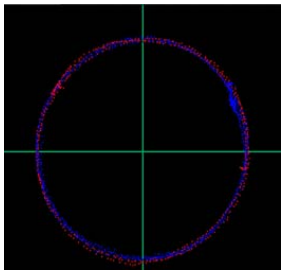
Step 4: Level the aircraft and make sure the blue LED is on, this indicates that the Attitude error is within 5 degrees from the horizontal and you need to try to keep the light on during calibration. Keep the head of the aircraft pointing away from you (You can see the attitude angle in the "Data" page) Now rotate the aircraft 2 to 3 times in circles ensuring the blue LED is always on. If the blue LED goes off this means the horizontal attitude is too great and you must first stop to adjust the aircraft until it comes on and then keep on rotating.

Step 5: Click "Vertical Alignment" in the dialog box, and click "OK" or “Cancel” and confirm.

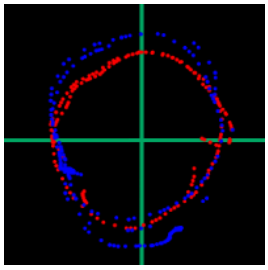
Step 6: Move the aircraft to the vertical position with the head pointing down and align it so the blue LED is always on (Attitude error must be within 5 degrees again Now rotate the aircraft 2 to 3 times in circles ensuring the blue LED is always on. If the blue LED goes off this means the vertical attitude is too great and you must first stop to adjust the aircraft until it comes on and then keep on rotating. Steps 4 to 6 are known popularly as the “calibration dance!”

Step 7: Click "Save Alignment" the dialog box, and click "OK".

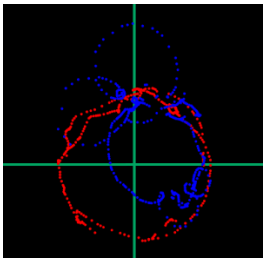
Step 8: Now the GCS software will automatically switch to the “Control” interface screen and spend some time calculating the recorded magnetic data. When it has finished it will display two circles, a blue one and a red one. During this process, the purple LED is always on. You need to wait for a minute or so and the process is completed when the LED goes off.



Excellent



OK



FAIL

The circles are shown in the pictures. If the circles are more or less round, this means the calibration has been successful. If not, then you need to do the calibration again.

8.3 Arming to unlock motors and allow rotation

NB: (1) Gemini (dual redundancy) motors cannot be unlocked and armed without connecting the GPS.

(2) Gemini motors cannot be unlocked and armed when CH5 is in position 2.

(3) When the difference between the aircraft's magnetic course and the external magnetic course is greater than 15° Gemini (dual redundancy) motors cannot be unlocked and armed.

(4) The motors cannot be unlocked and armed when there is a fault in any sensor.

For safety reasons, the GEMINI first stops then locks the motors on landing. They can only be re-armed to allow them to rotate and work after carrying out the "arming" procedure.

To arm you push the left-hand stick to the far left and extreme bottom, the right stick to the far right and to the bottom. This is for Japanese and American convention (mode 1 and mode 2) and is called the toe-out operation (Namely /\ type).

For Chinese and European operation (Mode 3 and Mode 4), you need to apply the toe-in operation to arm the motors (Namely \/ type)

After arming the motors you still need to advance the throttle stick to make the motors rotate. If it doesn't take off, some motors might slowly decrease speed or even stop rotating, this is normal. You only need to apply more throttle to take off normally.

NB: If after 5 seconds you have not applied any throttle then the motors will lock again automatically. In this case you would need to repeat the arming procedure.

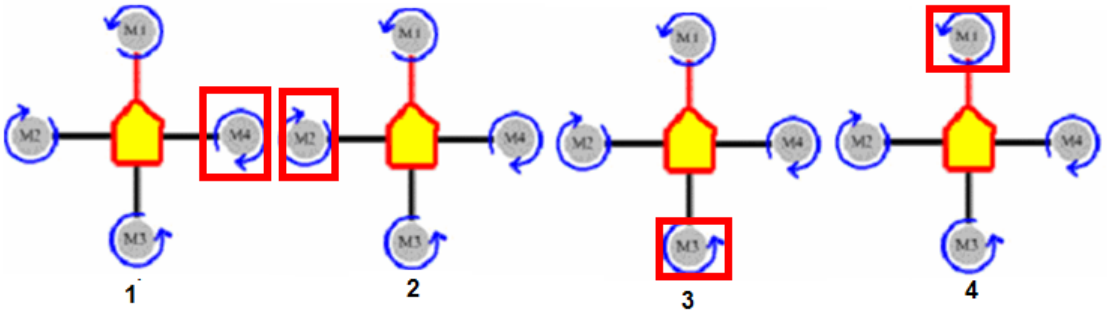
8.4 Checking Motor Mix control

Before take-off, you still need to check your motor mix control, you also need to check that your motors are spinning in the correct direction and the right motors are speeding up or slowing down when you move the sticks.

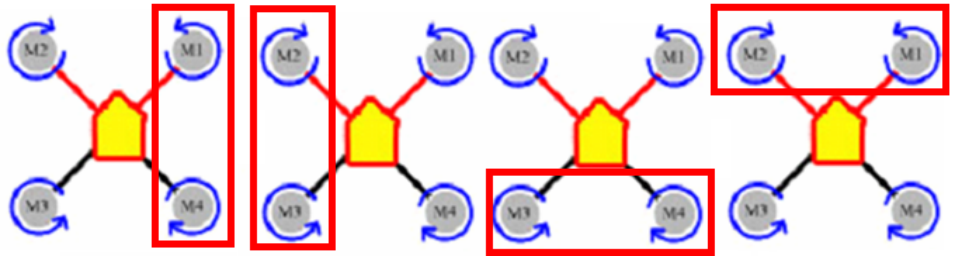
First let's take the quadcopter + type as an example to simply describe how to check motor mix control (Please refer to the illustration for other aircraft configurations). You need to switch to manual stabilization mode first, arm the motors and check what happens when you advance the throttle stick, if the four motors rotate at the same speed this means the motor balance is good.

1. To check the aileron channel, slightly push the aileron stick to the left, motor M4 should rotate immediately (see 1 on the illustration below), the other three motors should keep still. Push the aileron stick to the right slightly, motor M2 should rotate immediately (see 2 on the illustration below), the other three motors should keep still.

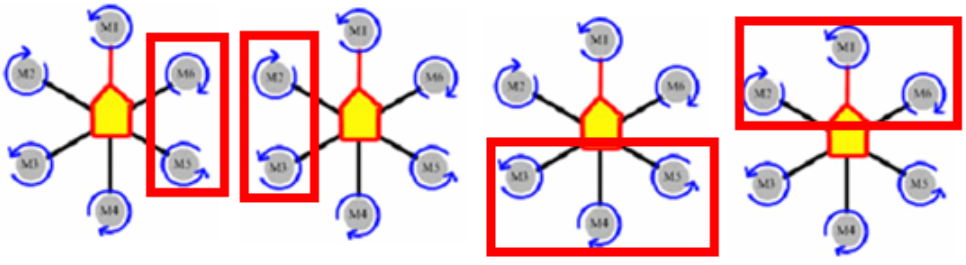
2. Check the elevator channel. According to the aircraft symmetry it should be similar to checking the aileron channel. Push the elevator stick up slightly, motor M3 should start to rotate (see 3 on the illustration below) now slightly pull the elevator stick down and motor M1 should start to rotate immediately (see 4 on the illustration below).



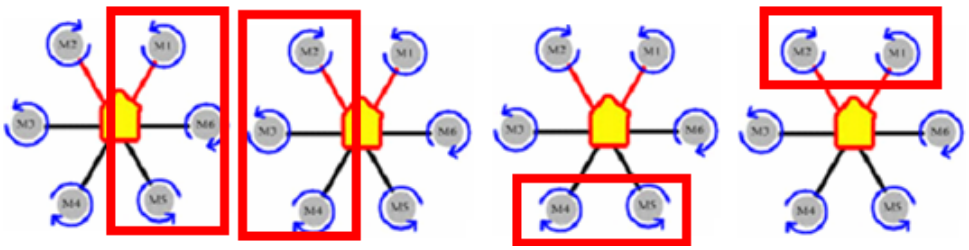
Quadcopter X type:



Hexacopter + type:



Hexacopter X type:



8.5 Parameter setup

8.5.1 Parameter setup of aircraft

The default parameters are for the quadcopter X type, the parameters are as below:

Roll sensitivity and pitch sensitivity would affect the degree of command response in flight (Default value is 45), Motion Compensation can increase stability but would decrease the sensitivity (Default value is 80). Throttle sensitivity would affect the sensitivity of height response control (Default value is 80). The maximum ascend/descend speed setup can be selected in the menu as 2m/s, 4m/s or 5m/s.

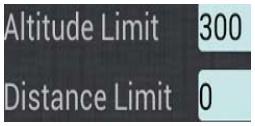
If you make an error entering parameters then decrease the throttle to zero and switch to

manual mode then select "Default" which will recover the default parameters.

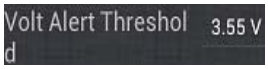
For an explanation of the other parameters, please see below:

The PTZ (Gimbal) roll output and PTZ pitch output. sensitivity is used to adjust the compensation angle of the PTZ data for your Gimbal. Your can compensate high or low for aircraft movement within a range from -127 to 127 (Note: You can enter a negative value to reverse the direction of compensation).

The autopilot can calculate the low voltage alert according to the Cell Number filled in by the user. If your cellphone vibrates once every 2 seconds it is a reminder that the power is getting low. When it vibrates continuously it means the power is getting very low and you should land at once.



This shows the highest and furthest distance which the aircraft can fly. The maximum height is 300 meters. You can enter the value 0 for unlimited distance. You can fill in your own distance limit value.



Enter the voltage per cell required to activate a low voltage alert, for a Lipo battery this would be normally 3.65v。

Choose to open parachute plus shutter when using brushless gimbal.

Enter the aircraft type, refer to chapter 3.1

Speed mode and optional attitude mode (No need to enter max speed when choosing attitude mode)

Setup maximum flight speed

8.5.2 Aircraft motion parameter adjustment

If there is too much deviation either in vibration or motion from its normal operation, the IMU may no longer be able to check the aircraft status. You must check that the configuration direction of the IMU is correct and it must be fixed firmly to the aircraft in a place where vibration is minimized. The GEMINI autopilot has internal vibration dampening so you should not add any extra damper like gel or sponge.

Firstly, the vibration coefficient and motion coefficient which is displayed on the ground station indicates the status of IMU vibration. You must balance all the propellers so that the vibration coefficient and motion coefficient remains below 10 during hovering flight. If this is not the case it is not possible to get ideal stabilization no matter how much you adjust the parameters. A loose, flexible or soft airframe will bring extra vibration, so please use an airframe in good rigid condition.

Secondly, the attitude adjustment of your multirotor depends on the motor rotation speed, so the sensitivity of sticks will directly affect the accuracy of attitude adjustment. You need to adjust the weight and distance between each propeller and gyro, to make the motor keep an adequate rotation speed. For an off-the-shelf multirotor this should already be incorporated into the design. Light-weight propellers should also be used to decrease inertia and improve stick sensitivity. For aircraft already designed to have the highest efficiency you cannot avoid degradation in stability due to these factors. You can only choose the right balance between flight efficiency and stability.

Thirdly, multirotor symmetry has a vital effect on its flight stability. Chapter 10.1.3 "Motor balance" evaluates the symmetry of motor and propeller. If the symmetry is not adjusted well, you would have to pay more attention to the aircraft body and power arrangements.

Fourthly, If the previous three steps are dealt with well, you can adjust the parameters in setting for the "Roll sensitivity" and the" Pitch sensitivity". You can also set up values for the power of aircraft attitude (the P value of proportional control); and adjust within some limits "Motion compensation" which sets up dampening of the aircraft attitude (D value of differential control) "Roll sensitivity" & "Pitch sensitivity" illustrate an angle speed error for which the default value is 45. Normally aircraft are within the range of 45-60, if the sensitivity is bigger the correction is faster and control response is more flexible. But if the sensitivity is too high this would result in high-frequency vibration especially in an aircraft with high rpm (high speed motor with small or fine pitch propeller) and you would need to decrease the

value. The minimum value of this parameter is 0, maximum value is 255.

"Motion compensation" corrects the aircraft motion (I value of differential control) and the default value is 80, normally the regular aircraft range is from 80 to 200. Without this compensation, if the stick efficiency is low (Low speed motor or big propeller) the aircraft might wobble after a stick movement before gaining stability. In this case the parameter should be increased until the aircraft rights itself without any back-lash or wobble. If the aircraft recovers from a control input with high frequency shaking, then this parameter should be reduced. The range is from 0 to 255.

9 Flying in the Field

9.1 Flight status

9.1.1 LED indicator status and definition

1) GPS and Flight Mode status indication

Shown as per table, Red +Blue (Or Red + Green) will display the status of aircraft.

LED mode	**Red LED** (All modes)				**Blue LED** (stabilization mode, or GPS not located)		**Green LED** (GPS mode and GPS located)	
LED Status	●●● Red LED flashes 3 times	●● Red LED flashes twice	● Red LED flashes once	Red LED off	● Blue LED flashes once	●● Blue LED flashes twice	● Green LED flashes once	●● Green LED flashes twice
Working status	GPS not located	GPS located with 5 satellites	GPS located with 6 satellites	GPS located with 7 or more satellites	Normal operation	Hover and altitude hold	Normal operation	Hover and altitude hold

NB: When flying outside please take off after the GPS has located 7 satellites or more. When the GPS locks for the first time, the autopilot will record the current position as "Home" position and will be used for the return home operation.

2）The white LED

① The White LED ① is a warning signal:

When an attitude error is too large or the GPS connection is lost, the LED will show continuous white

② How to respond to the White LED ①:

i. If the aircraft has flown an extreme maneuver but the white LED goes off after the aircraft becomes stable, then you can keep on flying normally.

ii. If the white LED stays on then you must land urgently to check the reason.

3）Low voltage alert

During flight, when the voltage reaches the first warning level defined in the GCS, the red LED will flash repeatedly●●●●●●●●●●●●●●●. You should land as soon as you can. The second level alert is a solid red LED. This would indicate that an emergency landing is required

4）Compass calibration

When you are calibrating the compass the blue LED will stay lit ● if the attitude error is less than 5. This means you can keep calibrating. If the attitude error is more than 5 the blue light will go off and you should stop and realign until it comes on again. After compass calibration is completed, the purple LED should come on ●, flashing every 2 seconds. When data calculation is completed the purple LED will go off.

9.2.2 Oscillation and Wobble

During the flight, observe the "Vibrate State" & "Shake State" in the "Data" section to judge stability status of the IMU. In stable flight, it is normal when the "Vibrate State "and "Shake State" is within the range from 0~9 (display in green). If the value is over 10 it will display in red.

You are aiming for the smallest number you can achieve. The size of the number will directly affect flying performance.

Definitions:

Vibrating coefficient is the maximum acceleration of alternate motion (oscillation) in three directions. (Up/down, left/right, back/forward)

Shaking coefficient is the maximum angular velocity of rotary movement (wobble) around three axes (X/Y/Z.)

9.1.3 Motor Balance and Throttle Stick Position

The display in the "Data" section of GCS includes the data listed below:

9.1.3.1 Motor balance

If the clockwise and anti-clockwise propellers lose balance (as well as reverse-torque), the status bar may display "clockwise/anti-clockwise propellers are not level" when the copter is hovering or maintaining course. You should then make sure the motor is correctly aligned horizontally and also try changing the propellers. You should carefully check whether motor and propeller are balanced and level until the motor balance displays "good" when hovering.

9.1.3.2 Throttle stick position

This indicates the average throttle stick position when hovering, the normal range is 40~65 (displayed in green). If the position is less than 40 (yellow) this shows that the aircraft is lighter than normal for the motor power and the ESCs are working in light load status. If the value is above 65 then the ESCs are working in high load status, or the batteries have insufficient capacity or voltage. If motor speed regulation is insufficient you may have unresponsive steering leading to possible flight failure.

9.2 Flight

9.2.1 Basic flight control

9.2.1.1 Phone (or tablet) Control

(1) Phone Remote Control Mode

① During flight, when the transmitter is switched to "Auto-hover" in "GPS mode", the aircraft will enter auto-hover mode. Now you can activate control of your aircraft via your cellphone by pressing "Enable Control" in the "Control" screen of your GCS.

NB: In phone remote control mode, transmitter control will not work.

②How to control your multi-rotor by phone or tablet:

Enable Control	User Interface Operations	Aircraft Status
Circle status	Red: GPS not locked Green: GPS locked.	-

Position Hold	No Operation	Position hold
Level Flight	Drag finger over screen: up/down left/right left/right top, left/right bottom etc.	move forward/backward move left/right Move left/right top, left/right bottom etc.
Climb- Descend- Turn	Click below the area inside the cross 1.over circle 2.under circle 3. left of circle 4. right of circle NB: (1) The distance between circle and click point is proportional to flight speed. The further the distance, the faster the flying speed. (2) Time pressing control circle is proportional to Aircraft movement time	1.Climb 2.Descend 3.Rotate to left 4.Rotate to right

③ If GPS is not located, for example when flying indoors, you can still switch to GPS mode to enable Phone Control. (Or Phone attitude control). The output signal of phone control (or phone attitude control) directly corresponds to the relevant transmitter control. When you switch back to manual mode, the transmitter will take over controlling the autopilot again.

（2）Phone attitude control mode

①Phone attitude mode can be enabled when in phone control mode.

Click "Enable Attitude Control" in the phone “Control” menu. After entering phone attitude mode, the color of the cross will change from Green to Blue. After exiting phone attitude mode, control will automatically revert to phone control mode.

NB:

Please place your phone level before enabling phone attitude mode; otherwise the aircraft will fly following your phone tilt direction after switching to attitude mode.

②Controlling the aircraft using “phone attitude control” mode:

Enable Control	User Interface Operations	Aircraft Status
Circle status	Red: GPS not locked Green: GPS locked	-
Position Hold	No Operation	Position hold
Level Flight	Tilt the phone: 1 up/down 2 left/right 3 left/right top, left/right bottom etc.	1. moving forward/backward 2. moving left/right 3. Moving left/right top, left/right bottom etc.
Climb- Descend- Turn	1.Press any available area on the screen and point the phone upwards; 2.Press any available area on the screen and point the phone downwards; 3.Press any available area on the screen and turn the phone left; 4.Press any available area on the screen and turn the phone right; **NB:** Holding & Moving distance = Flying speed, the greater the movement, the higher the flying speed. Holding time = flying time	1.Climb 2.Descend 3.Rotate to left 4.Rotate to right

9.2.1.2 Semi Auto-takeoff

When you have 7 or more satellites in view, switch CH5 to position 3 and CH6 to position 1, "auto-hover", now arm the motors and advance the throttle to more than half. The aircraft will take off automatically and auto-hover about 3 meters from the ground and maintain auto-hovering status.

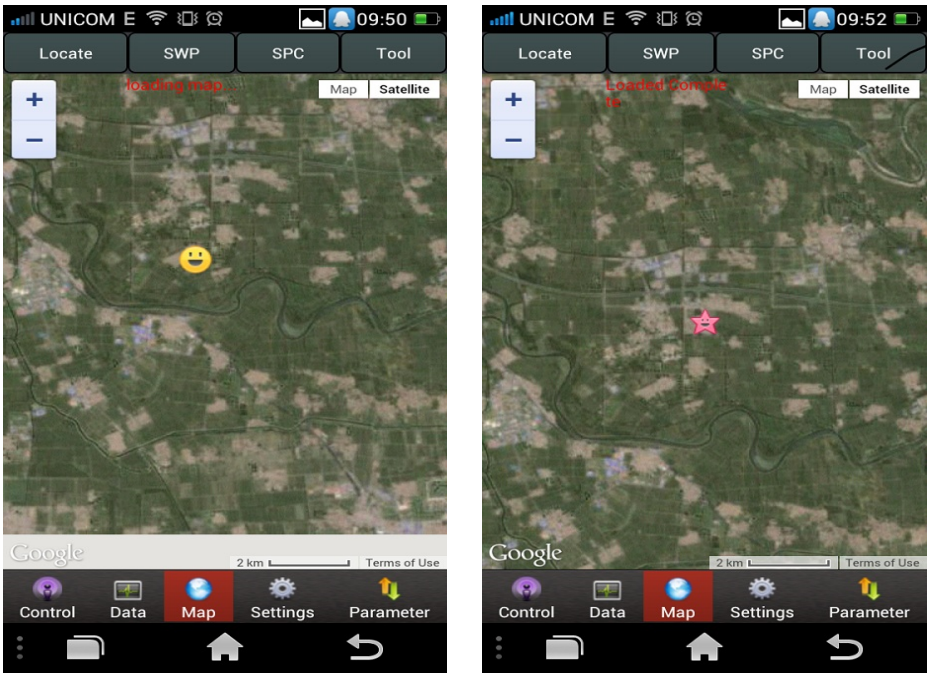
9.2.1.3 Return home & Land Mode

The autopilot will set the return-home position automatically when the GPS has locked with 7 satellites or more.

In GPS mode, when CH6 is moved to position 3 (auto-return home & landing), the GEMINI will auto-return home and land after 5 seconds. During return home and landing, the aircraft will not accept any Manual intervention. However, during the slow descent during the landing phase of return home and landing, the Gemini (dual redundancy) will allow you to provide flight input to adjust the landing area. For safety reasons, the minimum flying altitude for return home and landing is 20 meters. If flying lower than this, the craft will ascend to 20 meters. If the current altitude is more than 20 meters, the aircraft will keep the current altitude. If you need to cancel the return home and landing procedure, you can move CH5 to Position 1 (Manual Mode). Upon landing in this mode, the motors will stop slowly until the aircraft has completed the landing operation. After 5 seconds motor lock will take effect. You will need to arm the motors to unlock for restarting.

NB: Do not switch to "return home and land" mode when you are near the aircraft. It is dangerous to adjust flight status for a short time period.

9.2.1.4 Click and Fly to Point



MODE: GPS auto-hover mode

Step1:

Click any point on the map and a yellow smiley will appear there.

Step2:

Click the "Fly to PP" button in the Map page (the button will become grey if nothing happens after a few seconds and you would need to click on the map again for the smiley to reappear), the yellow smiley will change to a purple star smiley. The operation of flying to the next position will start.

NB:

If closer than 10 meters the craft travels without turning; beyond 10 meters, the head of craft faces the target point.

WARNING:

If the way point selected is too far away, the craft will fly out of sight, so you need to be cautious when using the Fly to Point function!

9.2.1.5 Waypoint Flying

Single-point editing (manually generated routes)　　Automatically generated routes

STEP 1:

There are 2 ways to generate waypoints; manually and automatically.

Waypoints designed manually:

In the Map page of your GCS, click “tools” then “Design waypoints" to set up waypoints. Each click on the map will enter a waypoint. Enter all your waypoints one by one. Click “Default Tool” to complete setting up waypoints.

- Each waypoint includes height, hovering time, speed, etc.
- "Height" is relative to the point where your aircraft is stationary (before flight). This value can be negative, this is normal. (For example if the take-off position is high and the craft needs to fly under the take-off position).
- If the altitude between two waypoints is different, the aircraft will fly in a climbing slope. The default height is the ”current height” meaning the craft will maintain the height at which it entered waypoint mode.
- "Hovering time" means the time that craft stays in its present position before flying to the next waypoint (the default hovering time in first waypoint is 65535 seconds)
- "Speed" means the flying speed that craft flies to the next waypoint from present position.

STEP2:

- After waypoint design is completed, the design can be saved as a file which can be used at another time. The user can also click on "Upload Waypoints" to upload the waypoints to Autopilot.
- Check whether each waypoint has been changed to **blue** to confirm a successful upload (**orange** indicates the upload is unsuccessful). Go to "Target Point" to check whether the waypoint number display is the same as the uploaded waypoints. If the value is different, you would need to upload once more.
- If any single waypoint is not changed to **blue**, you must upload the waypoints again.

STEP3:

- To cancel the waypoint design, press “Remove Waypoints” to make the **blue** waypoints return to **red**.
- To confirm that the waypoint have been correctly uploaded select “Verify waypoint” from the “Tool” folder.
- Download the uploaded waypoints to the GCS.
- Check and verify that all waypoints are coloured **blue**, which means the uploaded waypoints are the same as those in the GCS. If all waypoints are **blue** this will indicate successful verification.
- If any waypoint is **red**, reload the waypoints once more.

Step 4,

After switching CH5 to position 3 and CH6 to position 2, click on "enable skyway" in the setting page of the GCS. The craft will fly to the first waypoint and hover there. Enter "Change Target" to number 2 and upload it, the craft will fly to waypoint 2,3,4...and fly back to waypoint 1 and hover there. After finishing all waypoints it will be hovering at the first waypoint.

NB:

If waypoints are incorrectly uploaded, as soon as auto-navigation mode is selected the aircraft will automatically fly far away, out of control.

9.2.2 PROFESSIONAL FLYING OPERATIONS

9.2.2.1 Dual Transmitter Control

Notice: This function is used when flying the Z-Series brushless gimbal.

Rocker Arm in the air

a. The GEMINI (dual redundancy) flight controller combined with the Z-Series Gimbal and your dual transmitter setup enables you to fly Rocker Arm in the air Mode.
b. When using a Z-series gimbal, waypoints can be designed on the map in advance and uploaded to the MC. (See 9.2.1.5 designing waypoints). When in flight, move CH6 from Position 1 to Position 2. After 5 seconds the Gemini will automatically activate High Stability FPV Mode.
c. The aircraft head will now automatically follow the direction of the gimbal. This ensures the aircraft landing gear is never in the camera field of view.
d. Note that in this mode the aircraft heading is now fully controlled by the Gimbal transmitter. The aircraft will remain in hover hold position until you move your throttle stick, which will

signal the GEMINI to fly following your designated waypoints. (You do not have to press "Enable Waypoints" to start waypoint flying).

e. **IMPORTANT:** The higher the throttle input, the faster the aircraft will fly from waypoint to waypoint. Reducing throttle input will reduce flying speed until the aircraft returns to auto hover.

f. After completing waypoint flying, the Gemini will direct the aircraft to repeat the first waypoint.

g. Move CH6 back to Position 1 to exit Rocker Arm in the air Mode and return to hover mode.

h. Note that the Waypoint hovering time set-up becomes invalid.

<table>
<tr><td>Flying mode</td><td colspan="7">High stability FPV mode</td></tr>
<tr><td>Flying course</td><td colspan="7">Subject to gimbal course</td></tr>
<tr><td>Aircraft Head</td><td colspan="7">Aircraft heading always tracks gimbal lens direction</td></tr>
<tr><td rowspan="3">TX</td><td>TX Command</td><td>Rudder</td><td>Aileron</td><td>Elevator</td><td>Throttle</td><td>CH5</td><td>CH6</td></tr>
<tr><td>Aircraft</td><td>X</td><td>Controlled</td><td>Controlled</td><td>Controlled</td><td>Middle position</td><td>X</td></tr>
<tr><td>Gimbal</td><td>Controlled</td><td>X</td><td>X</td><td>X</td><td></td><td></td></tr>
<tr><td></td><td colspan="7">Notice: Gimbal pitch is controlled by Ch7 of aircraft TX</td></tr>
</table>

High Stability FPV mode

FPV mode is *first person view* mode. The aircraft's course will track the gimbal automatically to avoid the landing gear; the elevator and aileron of the aircraft will obey the video direction. Meanwhile the gimbal transmitter just controls the gimbal direction and the aircraft will follow it automatically.

（1） FPV in GPS Hover Mode

When in the GPS position hover mode with CH6 in top position, FPV mode will be activated 2 seconds after switching CH5 of the aircraft TX from its bottom position to the middle position.

In this mode, the craft nose will auto track the gimbal to dodge the landing gear, the elevator and aileron normally controlled by the pilot obeys the direction of the gimbal, rather than the direction of the aircraft. The pilot is controlling the gimbal rather than the aircraft. The elevator and aileron response is relative to the video direction. For example if you push the stick forward, the aircraft will move in the direction that the gimbal is pointing rather than in the direction which the aircraft is pointing. In another example, when in target lock and flying around the target in a circle, the pilot controls the camera to always shoot the target using the rudder, flies in a circle by pushing the aileron stick and controls flying distance with the elevator. To quit this mode, switch aircraft transmitter CH5 to the top position (manual mode)

or to the bottom position (GPS Hover mode).

Flying mode	High stability FPV mode						
Flying course	Subject to gimbal course						
Aircraft Head	Aircraft head always track gimbal lens direction						
TX	TX Command	Rudder	Aileron		Elevator	Throttle	CH6
	Aircraft	X	Controlled	Controlled	Controlled	Middle position	Top position
	Gimbal	Controlled	X	X	X		
	Notice: Gimbal pitch is controlled by Ch7 of aircraft TX						

(2) FPV in Manual Mode

The aircraft will enter FPV (manual mode) 2 seconds after switching CH5 of Aircraft TX from top position to middle position whilst flying.

In this mode, the direction of the aircraft will auto track the gimbal heading so as to dodge the landing gear. The elevator and aileron response which is controlled by the aircraft pilot are relative to the gimbal course, not the aircraft heading. Therefore, the aircraft pilot is directly controlling the gimbal rather than the aircraft. (The elevator and aileron response is relative to the video direction, pushing the stick makes the aircraft fly in the direction of the video rather than direction of the aircraft head)

For example, when in target lock and flying around the target in a circle, the pilot controls the camera to always shoot the target using the rudder, flies in a circle by pushing the aileron stick, and controls flying distance with the elevator. To quit this mode, switch CH5 to the top position (manual mode).

Flying mode	High stability FPV mode						
Flying course	Subject to gimbal course						
Aircraft Head	Aircraft head always track gimbal lens direction						
TX	TX Command	Rudder	Aileron	Elevator	Throttle	CH5	CH6
	Aircraft	X	Controlled	Controlled	Controlled	Middle	X

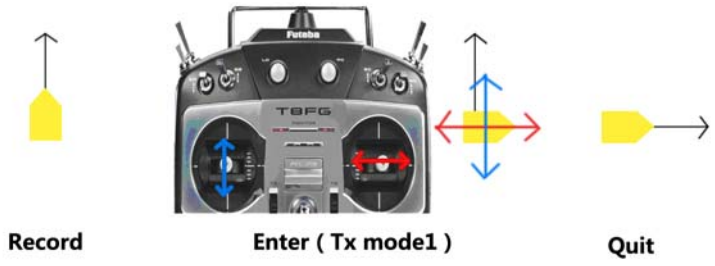
						position	
	Gimbal	Controlled	X	X	X		
	Notice: Gimbal pitch is controlled by Ch7 of aircraft TX						

C) Carefree Gimbal Course

Switch CH5 of the gimbal TX to position 1: gimbal not-tracking mode.

Switch craft TX to GPS mode so that the aircraft will hover when it starts flying and whenever there is no pilot input. Adjust the craft head to the desired direction when the Gimbal Course Carefree is enabled; switch CH5 of craft TX from position 3 to position 2. Two seconds later switch it back to the position 3 and then back to position 2 again. Now the craft head will move in the same direction as the gimbal head and keep pace with the lens direction in order to dodge the landing gear. This shows that the aircraft has successfully entered Gimbal Course Carefree mode.

In Gimbal Course Carefree mode, the direction of flying does not change and the initial direction when it entered Carefree is always forward, no matter what direction the aircraft nose is facing. The elevator and aileron controlled by the aircraft pilot are relative to the gimbal course only. The direction of the Gimbal Course is controlled by the gimbal TX, the craft nose will auto-track the gimbal and not be controlled by the pilot. As the diagram below shows, the yellow arrow faces the craft nose; the black arrow is in the direction of the flying course :



To exit Gimbal Course Carefree, switch aircraft transmitter CH5 to the top position (manual mode) or CH5 to the bottom position (GPS Hover mode)

Flying mode	Gimbal Course carefree						
Flying course	Subject to gimbal course						
Aircraft Head	Aircraft head always track gimbal lens direction						
TX	TX Command	Rudder	Aileron	Elevator	Throttle	CH5	CH6

	Aircraft	X	Controlled	Controlled	Controlled	Middle position	Top position
	Gimbal	Controlled	X	X	X		
	Notice: Gimbal pitch is controlled by Ch7 of aircraft TX						

9.2.2.2 Single Transmitter Operation

Notice: (1) Power on the transmitter, switch Ch7 of the TX from the top to the bottom position very quickly 3 times to enter single TX operation, this means the gimbal will be controlled now by the aircraft transmitter. (Repeat this another three times to enter dual TX mode).

(2) To **check** whether you have entered into the single TX operation mode: push the THR stick a little (5% is OK), the gimbal will activate stabilization if you have succeeded entering single TX mode. The roll and pitch of the gimbal will maintain the camera's balance, and the pitch of the gimbal can be controlled by CH7. The working mode of the gimbal is set to be independent of the aircraft heading when in single TX operation.

(3) The Gimbal will stop stabilization when the THR stick is pushed to the bottom position.

Rocker Arm in the air

a. When using the optional Z-serial gimbal, the waypoints can be designed on the map in advance and uploaded to the autopilot. (Please refer to the previous paragraphs to learn how to set up waypoints). In flight, when in GPS mode, if you switch CH6 from position 1 to position 2 and hold for 5 seconds, the autopilot will automatically open the "air rocker" function. Now the direction heading of the aircraft will automatically follow the direction of the gimbal in order to keep the landing gear out of sight of camera. This means that when in air rocker mode, the direction of the aircraft heading is different from the course direction; the aircraft head follows the gimbal yaw control. The aircraft will remain stationary until a push of the throttle stick makes the aircraft continue flying to waypoints. (There is no need to click "Enable Waypoints" to start waypoint flight). The more the throttle is increased, the faster the aircraft will fly. If you release the throttle stick the aircraft will revert to auto hover. After visiting all waypoints, it will start again from the first waypoint. Switching CH6 back to position 1 will make the autopilot exit from air rocker function and revert to auto-hover mode. (Waypoint hovering time is canceled)

Flying Mode	Rocker Arm in the Air (presetting waypoint)						
Flying Course	Waypoint direction						
Aircraft Head	Aircraft head always track gimbal lens direction						
TX	TX Command	Rudder	Aileron	Elevator	Throttle	CH5	CH6
	Aircraft	X	X	Only able to push stick forward or back to middle position	X	Bottom Position	Middle Position
	Gimbal	Controlled	X	X	X		
	Notice: Gimbal pitch is controlled by Ch7 of aircraft TX						

HIGH STABILITY FPV MODE

(1) FPV in GPS Hover Mode

When in GPS hover mode position, FPV mode will be activated 2 seconds after switching CH5 of the aircraft TX from its bottom position to the middle position.

In this mode, the craft nose will auto track the gimbal to dodge the landing gear, the elevator and aileron normally controlled by the pilot obeys the direction of the gimbal, rather than the direction of the aircraft. The pilot is controlling the gimbal rather than the aircraft. The elevator and aileron respond relative to the video direction. For example if you push the stick forward, the aircraft will move in the direction that the gimbal is pointing rather than in the direction which the aircraft is pointing. In another example, when in target lock and flying around the target in a circle, the pilot controls the camera to always shoot the target using the rudder, flies in a circle by pushing the aileron stick, and controls flying distance with the elevator. To quit this mode, switch aircraft transmitter CH5 to the top position (manual mode) or to the bottom position (GPS Hover mode).

Flying mode	High stability FPV mode						
Flying course	Subject to gimbal course						
Aircraft Head	Aircraft head always track gimbal lens direction						
TX	TX Command	Rudder	Aileron	Elevator	Throttle	CH5	CH6
	Aircraft	X	Controlled	Controlled	Controlled	Middle position	Top position

	Gimbal	Controlled	X	X	X		
	Notice: Gimbal pitch is controlled by Ch7 of aircraft TX						

(2) FPV in Manual Mode

The aircraft will enter FPV (manual mode) 2 seconds after switching CH5 of Aircraft TX from top position to middle position while flying.

In this mode, the direction of the aircraft will auto track the gimbal heading so as to dodge the landing gear. The elevator and aileron response which is controlled by the aircraft pilot are relative to the gimbal course, not the aircraft heading. Therefore, the aircraft pilot is directly controlling the gimbal rather than the aircraft. (The elevator and aileron are subject to the video, that is, pushing the stick makes the aircraft fly in the direction of the video rather than direction of the aircraft head)

For example, when in target lock and flying around the target in a circle, the pilot controls the camera to always shoot the target using the rudder, flies in a circle by pushing the aileron stick, and controls flying distance with the elevator. To quit this mode, switch CH5 to the top position (manual mode).

Flying mode	High stability FPV mode						
Flying course	Subject to gimbal course						
Aircraft Head	Aircraft head always track gimbal lens direction						
TX	TX Command	Rudder	Aileron	Elevator	Throttle	CH5	CH6
	Aircraft	X	Controlled	Controlled	Controlled	Middle position	X
	Gimbal	Controlled	X	X	X		
	Notice: Gimbal pitch is controlled by Ch7 of aircraft TX						

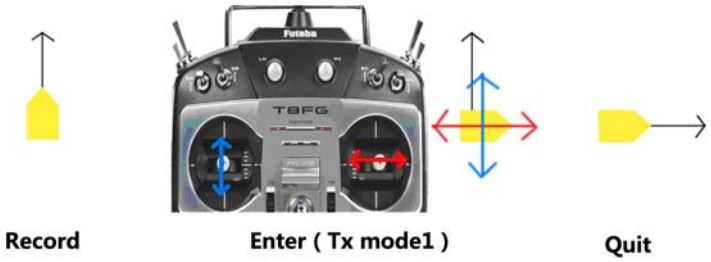
B) Gimbal Course Carefree

Switch CH5 of the gimbal TX to the position 1: gimbal not-tracking mode.

Switch craft TX to GPS mode so that the aircraft will hover when it starts flying and whenever there is no pilot input. Adjust the craft head to the desired direction when the Gimbal Course Carefree is enabled; switch CH5 of craft TX from position 3 to position 2. Two seconds later switch it back to the position 3 and then back to position 2 again. Now the craft head will move in the same direction as the gimbal head and keep pace with the lens direction in order to

dodge the landing gear. This shows that the aircraft has successfully entered Gimbal Course Carefree mode.

In Gimbal Course Carefree mode, the direction of flying does not change and the initial direction when it entered Carefree is always forward, no matter what direction the aircraft nose is facing. The elevator and aileron controlled by the aircraft pilot are relative to the gimbal course only. The direction of the Gimbal Course is controlled by the gimbal TX, the craft nose will auto-track the gimbal and not be controlled by the pilot. As the diagram below shows, the yellow arrow faces the craft nose, the black arrow is in the direction of the flying course :



To exit Gimbal Course Carefree, switch aircraft transmitter CH5 to the top position (manual mode) or CH5 to the bottom position (GPS Hover mode)

Flying mode	Carefree Gimbal Course						
Flying course	Subject to gimbal course						
Aircraft Head	Aircraft head always track gimbal lens direction						
TX	TX Command	Rudder	Aileron	Elevator	Throttle	CH5	CH6
	Aircraft	X	Controlled	Controlled	Controlled	Middle position	Top position
	Gimbal	Controlled	X	X	X		
	Notice: Gimbal pitch is controlled by Ch7 of aircraft TX						

10 Tasks

10.1 Gimbal

10.1.1 Servo Gimbal

PAR/PITCH on the MC is for the gimbal pitch servo and PHO/ROLL for the roll servo. "Roll Sensitivity" and "Pitch Sensitivity" in the Parameter Section of the GCS is for adjusting the magnitude of the correction angle of the gimbal. The Gimbal Sensitivity range from 0 to 127 may be adjusted to make the correction smaller or larger. Negative values 0 to -127 may be used to reverse the servo direction.

Use channel 7 on your transmitter for gimbal control and assign it to a knob switch.

Channel 7 will now adjust your gimbal pitch location and will continue to stabilize the camera at all angles of pitch. The spare channels may be used for other applications.

Normally roll servos will maintain gimbal stabilization in the middle position. If your gimbal tilts to one side it can be adjusted it by clicking "Enter Setup" in the Setting section (CH5 must in manual and the throttle set to minimum) Now the CH7 knob can be used for controlling gimbal roll. The gimbal roll's balance position may be fixed and saved by clicking "Quit Setup". Now CH7 will revert to controlling gimbal pitch.

10.1.2 Brushless Motor Direct Drive Gimbal

Brushless motor direct drive gimbals can reach a very high stabilization level (right down to pixel level), the GEMINI supports brushless motor direct drive serial gimbals produced by ZERO TECH. They are simple to set up, all you need do is connect ports PTZ1, PTZ2 and PTZ3 on the MC to ports PTZ1, PTZ2 and PTZ3 of the Z series gimbal controller without setting any

parameters.

The brushless motor direct drive gimbal comes with its own Z series gimbal controller, power and receiver, and is controlled independently by one pilot. For detailed instructions, please refer to the ZERO-TECH Z series gimbal manual which can be downloaded from the official website http://www.zerouav.com

10.2 Shutter Function

The output channel "PHO" of the autopilot provides a shutter function by outputting a high/low electronic TTL output. The top pin is signal, middle pin has no connection and the lower pin is ground.

A high level signal output of 3.3V is activated when "Take Photo" is clicked in the "Settings" page of the GCS. The signal then grounds at 0V for a short period of about 400ms and then pulls up to 3.3V again. This format of high-low-high level output supports Canon (and similar) cameras including 550D/600D/5D Mark II etc. Shutter control.

11 Emergency Protection

11.1 Arm and Disarm motor

11.1.1 Arm motor

Arming can only be achieved in Manual Mode after pulling the throttle stick to the bottom before take-off. After landing the motors will lock after 5 seconds and the motors will not be able to rotate when the throttle is pushed. The motors can rotate only after you have carried out the "arm motor to unlock" procedure referred to in chapter 7.3.

11.1.2 Disarming the Motors (Make Safe)

Normal method to disarm motors:

In manual mode, disarm the motors by pulling the throttle back to the bottom. In GPS mode, pulling the throttle to the bottom will only reduce the height but not disarm the motors. If you land in GPS mode you must switch to manual mode first and keep the throttle at the minimum

position. Now the motors will stop and become locked.

11.2 Returning Home After Loss of Control

1）When the WI-FI signal is lost

If the WI-FI signal is lost for more than 1 second, control will be handed back to the RC transmitter.

If the autopilot is flying waypoints when the WI-FI signal is lost, then the aircraft will keep flying waypoints normally until it has completed the task and then return to waypoint 1, auto-hover and wait for your command.

2）When the transmitter signal is lost

You must read your transmitter manual carefully and setup failsafe (F/S) correctly. If CH5 is a 2-position switch then switch CH5 to position 2 and CH6 to position 3. The throttle should be set to middle (See installation guide).

If the transmitter is disconnected or F/S is enabled for any reason, the aircraft will switch to auto-hover. (It will keep waypoint flying for 5 seconds if navigating) It will then wait for 5 seconds, if the signal still does not recover after 5 seconds it will activate the return-home sequence.

11.3 Opening of Safety Parachute Protection

NB:

1. The parachute power supply MUST be independent of the autopilot.
2. Power on the autopilot first and check that it works normally BEFORE connecting the servo of the safety parachute.
3. Payload weight must not exceed the safety protection range of the parachute. The maximum battery payload would be 15000mah.

11.3.1 Automatic Deployment of Safety Parachute

In GPS mode, the autopilot will regard the craft attitude to be abnormal if the craft tilts to 70 degrees and trigger the parachute which will then greatly reduce the falling speed of the aircraft.

Notice:

(1) Interference, rudder judder or low power will make parachute activation fail.

11.4 Data Recording “Black Box” Function

YS series flight controllers including the GEMINI all have a data record function (black box) for analysis in the event of an unexpected accident. Data will be recorded whenever flying starts without any intervention, but only one minute’s worth of data will be recorded before a crash. Therefore, if you have crashed please do not take off again or even activate the throttle after motor arming if you want to preserve the last one minute of data.

How to recover the recorded data:

Repower the flight controller and make sure WI-FI and phone are connected. Then click the “one min data” button in the settings section. Now the data sent from the flight controller to the phone will be the last minute’s worth of data and it will take one minute to display. The data will display on the GCS and you will have the option to save the “T-1min.hj” file in the folder “YShj”. You can now send it back to us for analysis.

12 Additional Module Options

12.1 Data Link Connection

• The XB-PRO900 Datalink is used to extend communication range beyond that of the WI-FI distance limit.

• XB-PRO900 Data link Technical Specification:

Transmitted power:	100 mW
Frequency:	900 MHZ
Communication Distance:	not less than 2 ~ 3 km (in unobstructed areas).
Comm. Port:	RS232
Communication Baud Rate:	115200 BPS.

• The XB-PRO900 Datalink must have two data links, one is installed on the craft and the other is on the ground. The two may be interchanged.

12.1.1 Installing the DataLink on the Multi-rotor

Remove the WI-FI module from multi-rotor, install one data link on frame and connect it to the GEMINI COM port.

12.1.2 Data Link on the Ground

Connect the WI-FI module that you have removed from the GEMINI to another Data Link

using the wire that comes with the data link This will supply power together with the wireless router on ground. Thus there are three electronic units on the ground: The Data Link, the WI-FI module and your Wireless Router.

NB:

• There is no need to use a router if your WI-FI is configured in PTP (peer to peer) mode.

• The Data link and WI-FI module are both powered by a 3 S ~ 6 S lipo battery (same as the MC) The power line is red-black, red is positive and black is negative.

12.2 POWER MANAGEMENT MODULE CONNECTION

The Data page of the GCS will display the current voltage and battery consumption when the Gemini (dual redundancy) is powered via the power management module. The Power Module is connected via the AI1 port of the MC.
Push the throttle stick to the bottom, and then repower the autopilot on. After powering, the autopilot will zero its power sensor automatically, the current discharge (ampere A) and battery consumption (MAH) will be detected by the power management and displayed by the GCS

12.3 On-screen-display (OSD) Connection

When the ZeroOSD module is connected to the Gemini, a head-up display (HUD) of flying parameters will be superimposed on the flight video, considerably increasing the value of flight telemetry for the pilot! (Please check the ZeroOSD manual for more detail)

13 Firmware Upgrade

Upgrading GEMINI firmware is simple! Before upgrading firmware, please download the special firmware upgrade tool on the Zero UAV official website.
http://www.zerouav.com/en/service/Download/Firmware/

NB: Upgrade the firmware on the Main Unit and the Slave Unit separately because the firmware is different.

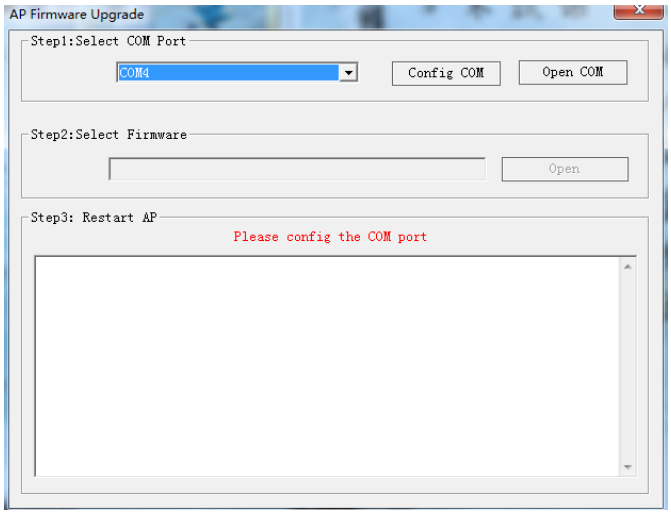
Connection: Plug the serial converter end of the USB cable into the PC USB port, the other end to the COM port on the Flight Controller, white cable up.

Step1:

Make sure the Flight controller is not powered on.

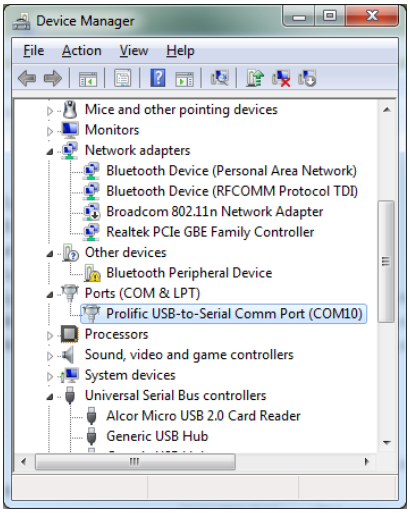
Run the "GEMINI PC Firmware Upgrade" program, and then click on "AP Firmware Upgrade"

The dialogue shown below will open:



Step 2

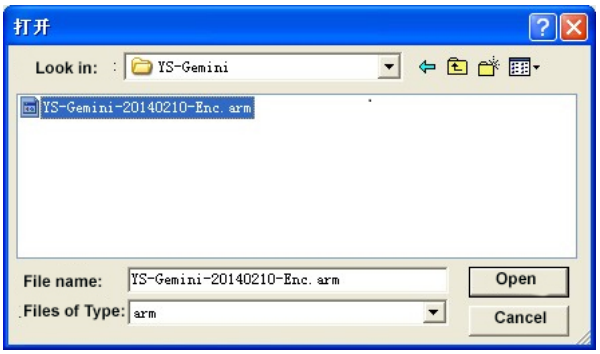
Enter the COM port (if you do not know which COM port on your PC is being used, right click "My computer"->"Properties"->"Device manager"->"port"(COM & LPT)to check)



Press "open COM" and the "Open" button will become active (change from grey to black).

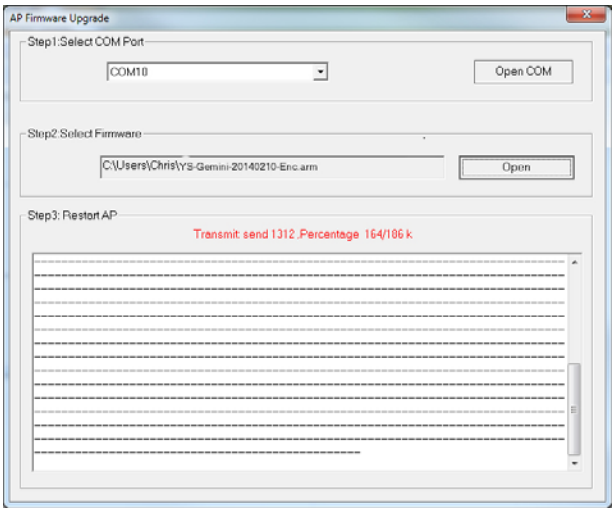
Step3

Press "Open" button and choose your downloaded .arm firmware file as shown below:

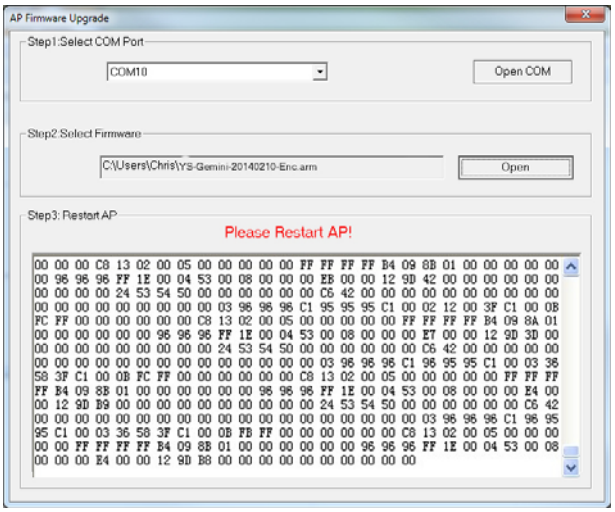


Step4

Power up the flight controller and the program will auto-upgrade.



Power-off the autopilot when it says in red, "Please Restart AP!" and then close the program.



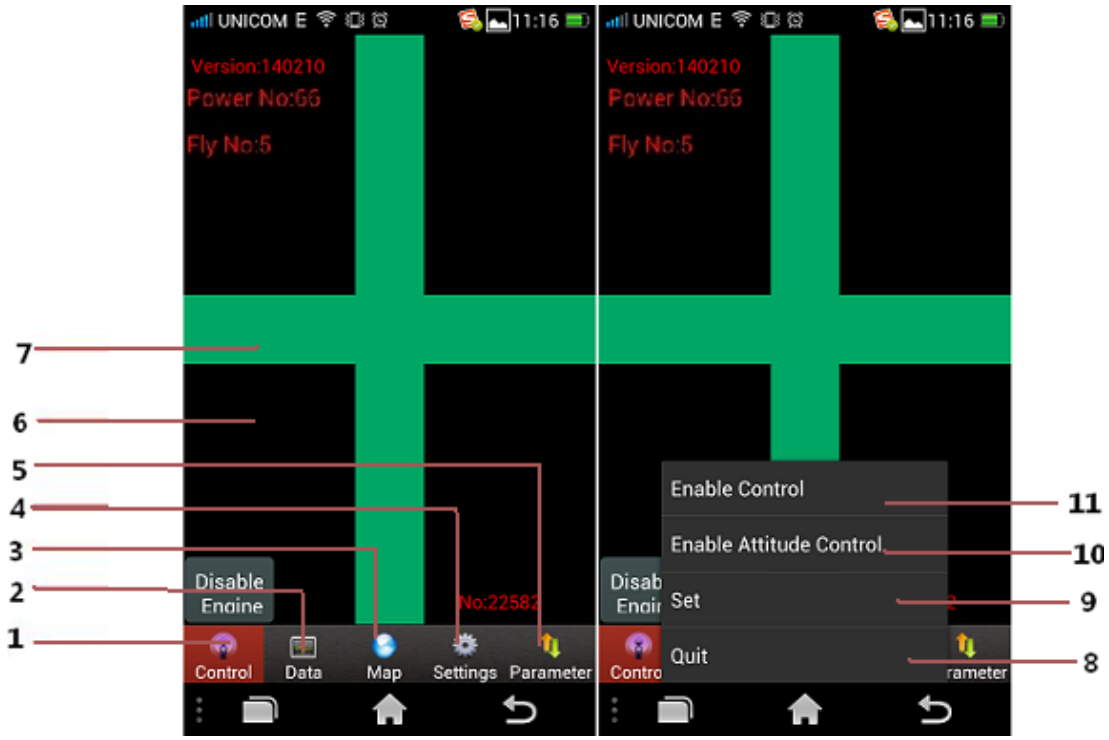
NB:

If the upgrade is completed, but the software refuses to operate after repowering the autopilot you need to plug and unplug the COM cable once more after closing the software.

Appendix

Phone GCS Introduction

1. The GCS Control Screen interface is shown below:



Software Function List

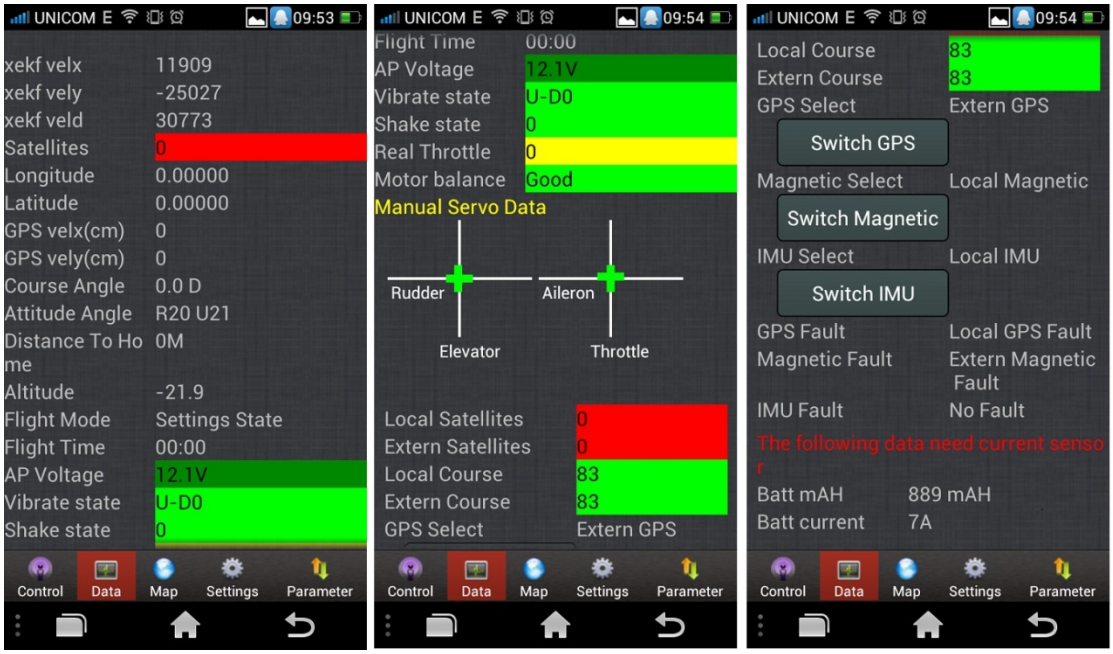
No.	Button	Function
1	Remote Control	Default interface (Green Cross) to control the aircraft
2	Data	Real time flight data
3	Map	Real time map or saved map
4	Settings	Setup craft status
5	Parameters	Adjust craft parameters
6	Cross Interface	General flight control
7	Round Circle in Cross	A button to control the flight by moving your finger over the screen of the phone or tablet
8	Enable/Disable	Used to Enter or Exit phone attitude control mode

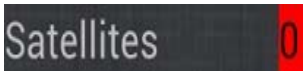
	Attitude Control	
9	Quit	Exit Ground Control Software
10	Enable/Disable	Enter or Exit phone control mode
11	Remote Control settings	Service setup (IP, Voice prompts, TX mode)

Notice: When data is connected, the serial number and firmware version will be displayed in the control screen.

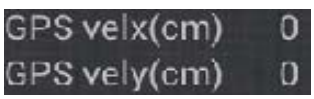
2. Data Interface

Get into the "Data" interface by touching the button "Data", shown as below: It will display "Communication Disconnected" with data uncommunicated.

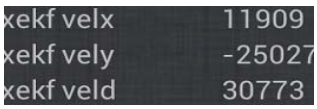




Shows how many satellites are locked



GPS velocity displays a value below 10 when static



Velocity after Kalman filtering. A value between 0-20 is displayed and will increase constantly. When the velocity exceeds its normal range the LED will be solid white and the aircraft should be landed urgently

Displays real-time attitude angle during flight

Displays current craft state: Manual, Manual Altitude Hold, Auto Hover, Auto Navigation, Auto Go Home and Land; setup status.

Barometer altitude of aircraft, units in metres

Aircraft compass heading: Due North=0 degree, clockwise direction is positive, counterclockwise direction is negative. For example: Due East=+90 degree, Due West=-90 degree, Due South=+180

Autopilot Voltage

GPS Longitude and GPS Latitude

Displays motor balance status

IMU vibration status: 1-10 means your craft is in good condition. Above 10 and vibration exceed its limits. Up and down U-DO is the vertical and Shake State is the horizontal vibration status of the IMU. (front/back and left/right)

Flight Time

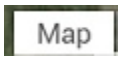
Real position of Throttle

MAP Interface

The first time you open the "Map", you must connect to the internet to download the map of your area of interest. Next time you open this map it will be shown as the default. When there is no internet, cached data will be displayed.

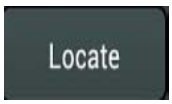
Zoom in

Zoom out

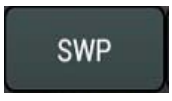


Map mode

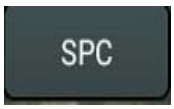
Satellite mode



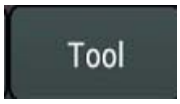
Map location (My location, aircraft location, location search)



Target Lock and fly to point

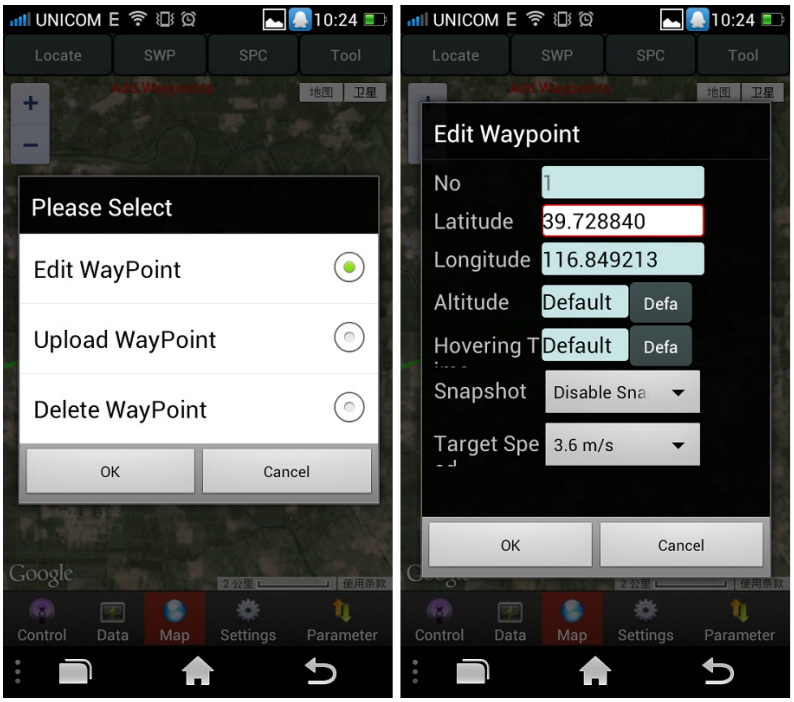


Used to control waypoint flying



Map Tools

Editing Waypoints:



Edit Waypoint: Used to edit the properties of waypoints such as Longitude/Latitude/Speed.

Upload waypoint: Upload this waypoint

Delete waypoint: Delete this waypoint

Number: The number of waypoints

Height: Waypoint altitude, in meters

Longitude: Longitude of the waypoint

Latitude: Latitude of the waypoint

Hovering time: Hovering time in seconds. A value of 0 will disable hover

Snapshot: Used to change the properties of the camera shutter

Target speed: Flight speed to the next waypoint

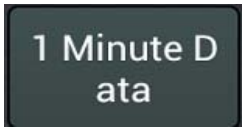
Settings Interface:

Make sure to setup each function carefully because all options are vitally important.

With no wind, in manual mode, after flying and trimming activating this will define the neutral point. **NB:** Make sure your TX throttle stick is in the middle position; it does not affect the actual throttle position.

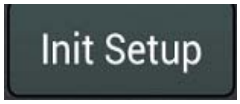
Used to calibrate the transmitter's joystick

Click to enter into "Magnetic Compass" Calibration mode, the status bar above displays the calibration status.

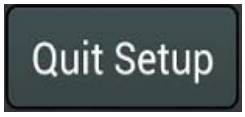


Used to initiate reading the data saved in the FC within the last minute of flight. Please refer to Chapter 10.4.4 Data Recording – "Black box" function.

The "Installation Guide" will guide you through installation and alignment step by step

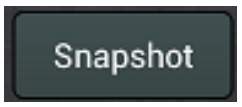


Used to align channels or enter parameters of craft. Flight status will display "Settings" after clicking this button. Once in settings, the control channels for each motor on the craft are directly connected to the throttle channel of the TX and there is no mix output.



After completing Throttle Alignment and when all parameters have been entered, you may click this button to exit from settings.

Zero the gyro. The aircraft should be perfectly level when you do this.

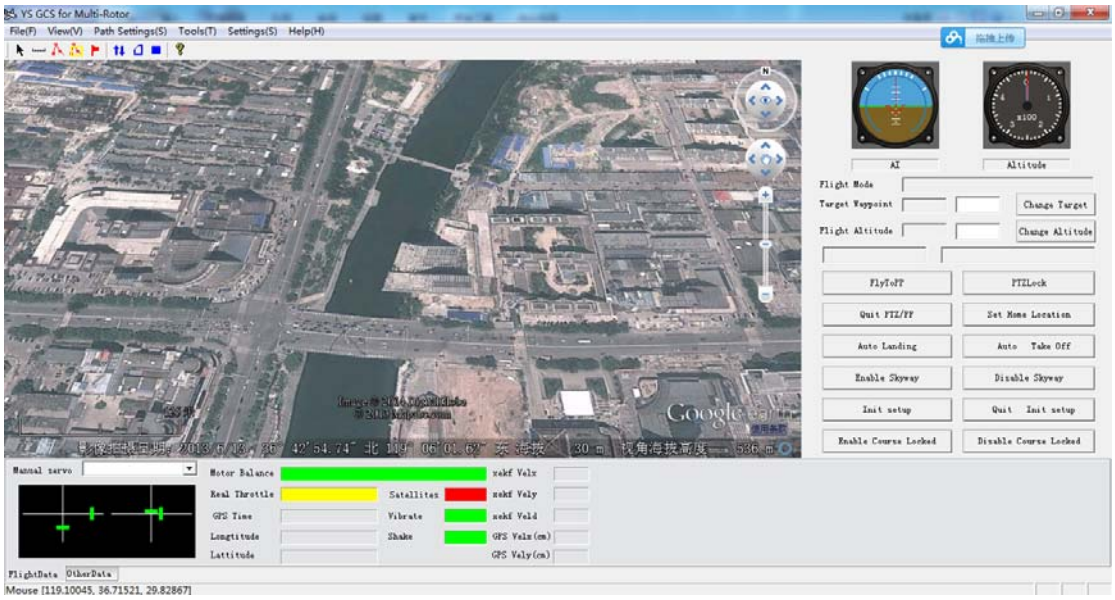


Manually triggers the camera shutter

Defines custom mixing of throttle, roll, pitch and yaw.

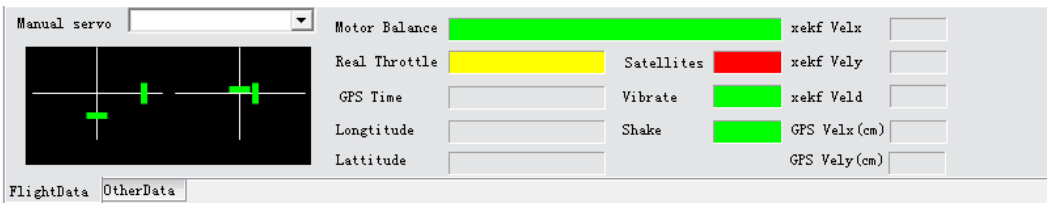
PC GCS Introduction

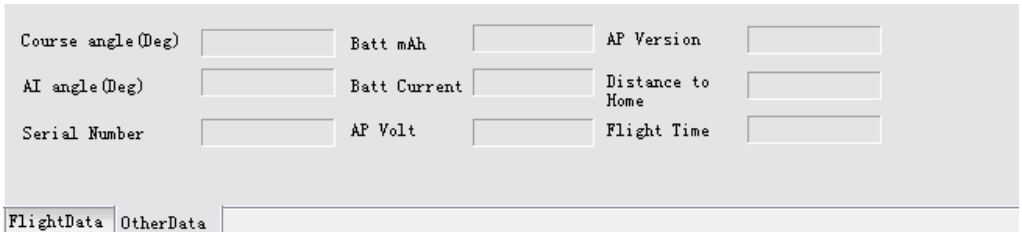
1. Main Interface



2. Instrument Panel & Function Key

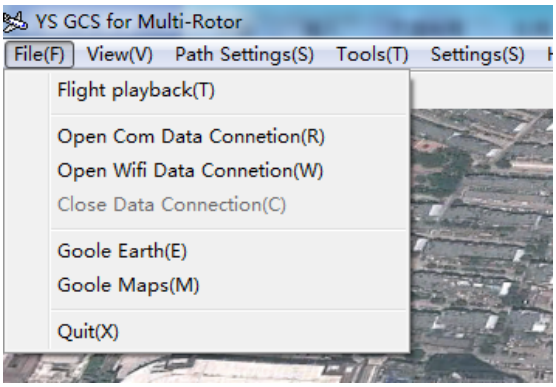
3. Status Bar of Flying Data



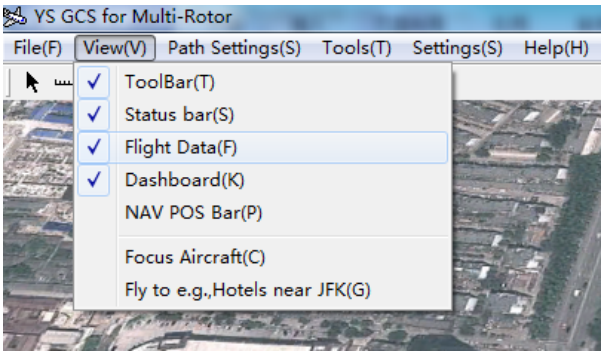


4. Brief introduction to menu

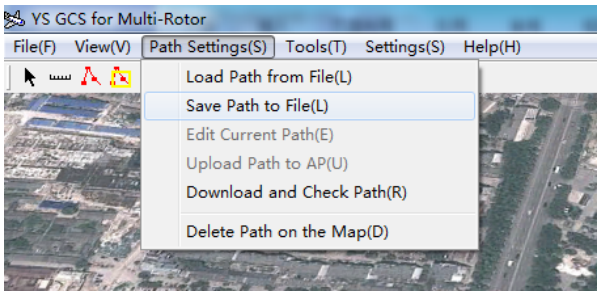
4.1 File



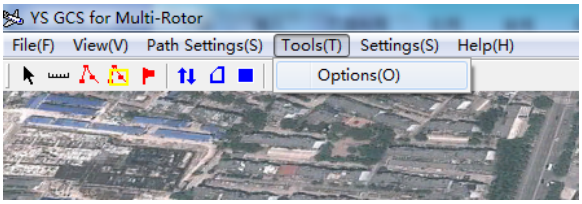
4.2 View



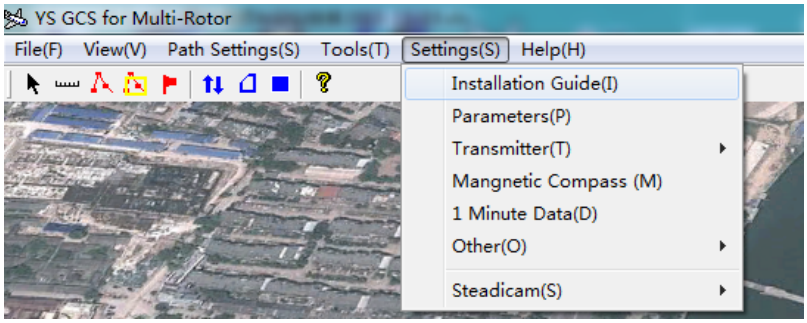
4.3 Path Settings



4.4 Tools



4.5 Settings



4.6 Help

Brief introduction to Software Version

LED Analysis:

GPS not located red light blinks in cycles of 3. ●●● ●●● ●●● ●●●

5 GPS satellites red light blinks in cycles of 2. ●● ●● ●● ●● ●●

6 GPS satellites red light blinks in cycles of 1. ● ● ● ● ● ● ●

7 or more GPS satellites the Led doesn't blink.

In GPS mode the satellite Led status blinks PLUS Green light periodically blinks

For example ●●●● or ●●● or ●● or ●

Green light blinks once per loop means the normal operation;

● ● ● ● ● ● ● ● ● ● ●

Green light blinks for two time one loop means Auto-hover and Altitude Hold.

●● ●● ●● ●● ●● ●● ●● ●●

When the LED is solid red it indicates a Barometer initialization failure on the ground so you need to repower the flight controller.

Abnormal craft status is indicated by the white light blinking: □□□□□□□□□□□

When the difference between the GPS reading and the attitude is too large or the GPS connection is loose, the LED blinks in white (craft status is abnormal). You need to check the GPS connection.

LED status after recovering from an excessive maneuver:

White light off - continue to fly; X

White light on - land urgently; □

During flight:

First stage low voltage alert - Red light blinks fast

Final stage urgent low voltage alert - Led solid red.

Whilst calibrating compass:

Attitude error less than 3° the blue light stays on and you can continue the calibration dance.

Attitude error greater than 3° the blue light goes off and you must pause the dance and align the airframe until it comes on again. Now you can continue the calibration dance.

Magnetic Field

After calibrating the compass the Led will go solid Purple until the GCS has finished calculating the data.

Magnetic declination

Fill in the correct magnetic as an integer without decimals by referring to:

http://magnetic-declination.com or:

http://www.ngdc.noaa.gov/geomagmodels/struts/calcDeclination

NB: For magnetic declination conventionally West is negative (-) and East positive (+). However for the YS-X4-P it is reversed (West positive + and East negative -) This is because declination is to the West in most regions of China.

NB:

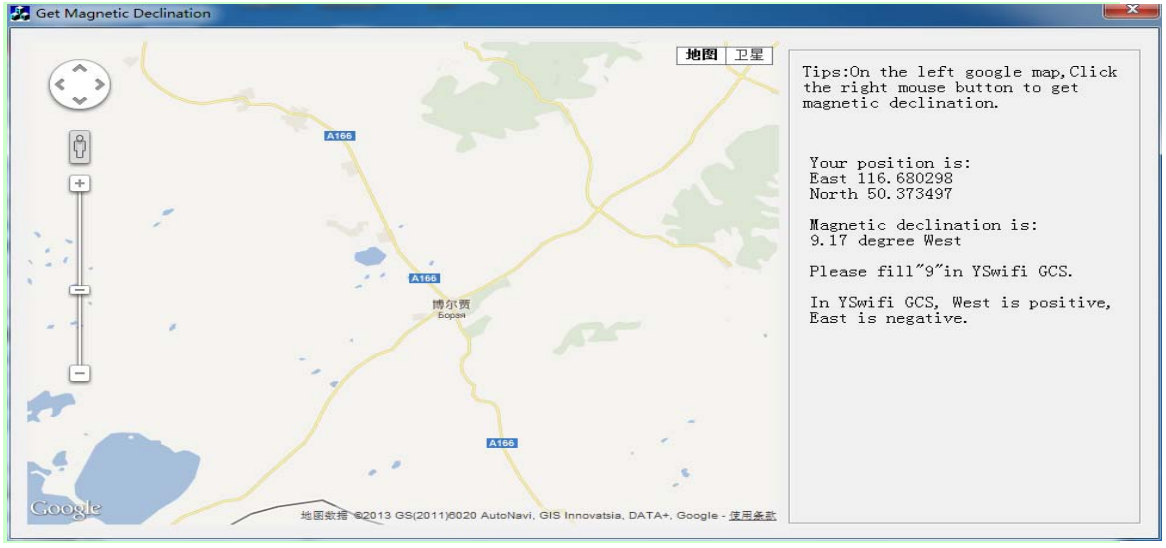
Make sure you fill in a round number (integer) for declination in the GCS. You MUST enter a positive number for West declination and negative for East.

For example: Fill in the number 7 if the declination is 7.23 ° West; please fill in the number -7 if the declination is 7.23° East.

You can also click on the following link to download declination query software:

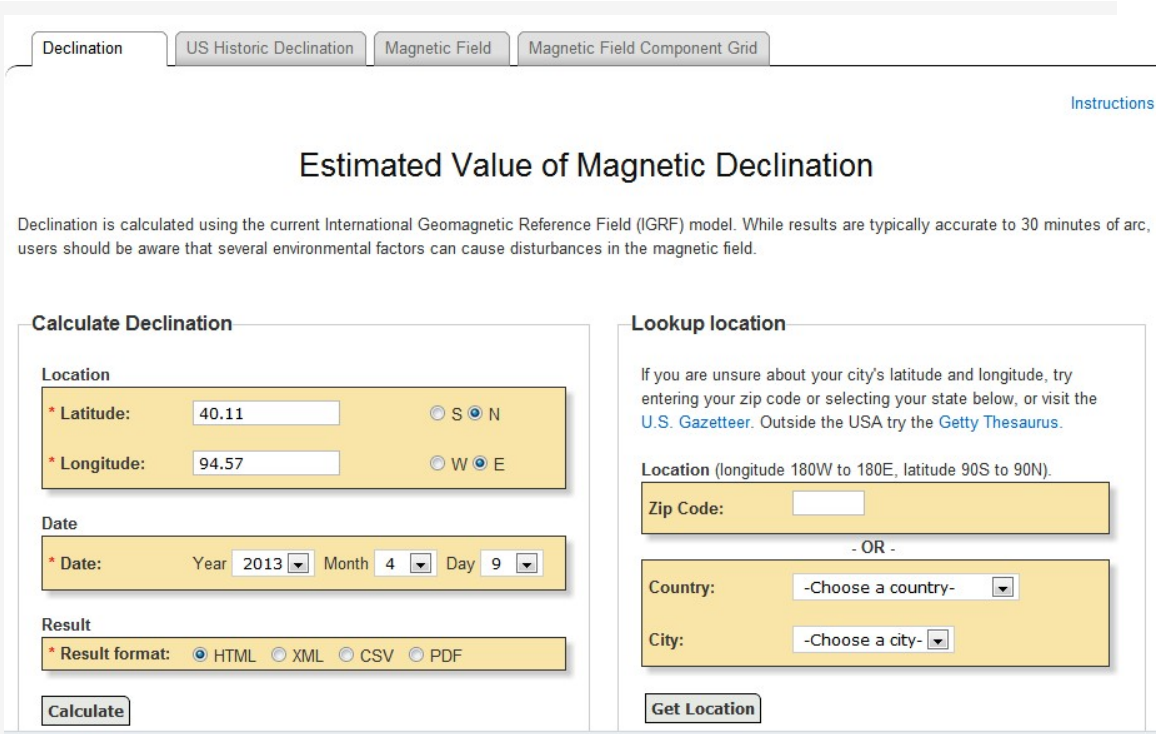
http://www.zerouav.net/site_mag/UpLoads/GetMagnetic.rar

With your PC connected to the Internet, open the software then click on the "Map" or "Satellite" icon then operate guided by the software tips on the right. If you right-click on the map area, you will see the longitude and latitude and the value of the magnetic declination.



1. Option2: The Magnetic declination query software described above is not available for the time being because the server at magnetic-declination.com/ has a problem. Therefore we temporarily recommend you use the site below to check the magnetic declination at your location.

http://www.ngdc.noaa.gov/geomag-web/#declination



The screen below will appear if you click: "Calculate"

Here the declination is 0.23° therefore you must fill in the integer 0 in the GCS

Installation and configuration videos:

Configuring WI-FI module video https://www.youtube.com/watch?v=Mr-wstSz3as

Upgrading firmware video http://www.youtube.com/watch?v=wkjqqqfBUik

Contact:

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